WEIL-McLAIN

WM97+
WALL MOUNT GAS BOILER

CERTIFIED

DESIGN CERTIFIED

Gas-Fired Water Boilers

WM97+70/110/155 - CT

Boiler Manual

- Installation
- Maintenance
- Startup
- Parts

Now available
Matching High Performance
WM97+
Companion Water Heater
(Unit sold separately)

ENERGY STAR

Mobile Product Library

⚠WARNING This manual must only be used by a qualified heating installer/service technician. Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

Part number 550-142-120/0113

The WM97+70 & 110 Gas-fired water boilers

1. **Stainless steel firetube heat exchanger**
2. **Heat exchanger access cover/burner mounting plate**
3. **Blower**
   The advanced blower design and air inlet silencer on WM97+ boilers result in very quiet operation.
   Air enters the boiler enclosure through the air intake adapter (18), flows through the enclosure, enters the air inlet silencer (5), then enters the blower. The blower pulls air through the silencer and pushes it into the venturi (6), where it mixes with gas before entering the burner.
4. **Gas valve**
   The automatic gas valve (4) senses the vacuum in the venturi caused by flowing air, and allows gas to flow when power is applied. A manual gas valve is shipped loose with the boiler. It allows shutting off the gas supply for servicing or shutdown. See instructions in this manual for manual gas valve installation.
5. **Air inlet silencer**
   The horn-shaped air inlet silencer significantly reduces fan noise, providing exceptionally quiet operation.
6. **Venturi**
   When air flows through the venturi, it creates a negative pressure. This vacuum pulls gas from the gas valve. So gas will only flow if air is flowing. The gas mixes with air in the venturi. The gas/air mixture then flows into the burner.
7. **Outlet water temperature dual sensor**
   This dual sensor monitors boiler outlet water temperature. The WM97+ control adjusts boiler firing rate so the outlet water temperature is correct, based on the calculated (if outdoor reset used — see page 133) or fixed target temperature.
8. **Return water temperature sensor**
   This sensor monitors return water temperature. The WM97+ control reduces or increases boiler input, depending on how close the return water temperature is to the outlet water temperature.
9. **DHW tank or CWH piping connections**
   An indirect storage water heater can be piped to these connections for direct connection to the boiler. The installer must supply the circulator for a DHW boiler water loop. CWH (Companion Water Heater) units are shipped with a circulator.
10. **Electronic display & buttons**
    The electronic display is used to configure boiler settings and monitor boiler operation.
    The buttons allow changing display mode, selecting and adjusting control settings, and resetting the control after lockout.
11. **Flue adapter (fits 3" PVC)**
12. **Burner**
    Made with high-grade stainless steel construction, the burner uses pre-mixed air and gas. The burner and control provide modulating firing.
13. **Water outlet pipe (system supply)**
14. **Water return pipe (system return)**
15. **Gas connection pipe**
    Manual gas valve is shipped loose. Other ½" NPT gas connection pipe and fittings (including union) shown must be supplied by the installer.
16. **WM97+ control**
    The WM97+ control responds to signals from the room thermostats, DHW aquastats (if used), boiler sensors (boiler return, boiler supply, flue temperature, and outdoor temperature, if used — see page 133). The control automatically adjusts blower speed (and gas flow rate) to match boiler output to space heating and/or DHW heating demand. The control provides for three heating zones (DHW plus two space-heating or three space heating). DHW direct-connected to the bottom piping connections can be set for domestic priority.
17. **Multi-position WM97+ control housing**
    The WM97+ control is mounted in a plastic housing assembly that can rotate forward for rear access to the control boards or for access to boiler components. It can also be removed through slots in the boiler jacket sides.
18. **Air intake adapter (fits 3" PVC)**
19. **Electrical entrances**
    The left side electrical enclosure (19a) houses the line voltage terminal block. The right side electrical enclosure (19b) houses low voltage terminals.
20. **Boiler drain valve (not shown)**
    Shipped loose for field piping to DHW return line at bottom of boiler jacket. See instructions in this manual.
21. **Integral expansion tank**
    The 3.2-gallon internal expansion tank is factory installed as shown. It is supplied with an isolation valve that allows removal for service or replacement without draining the system or boiler.
22. **Flue gas condensate drain**
    Flexible plastic hose is provided to adapt to 1" PVC (fits in 1" PVC coupling).
23. **Flue gas condensate drain trap assembly**
    The condensate trap assembly is field-installed, connected to the condensate trap nozzle as shown in this manual.
24. **Front door**
    The front door is sealed to the boiler assembly around its entire perimeter.
25. **Front door latches**
    Two latches secure the door in place.
26. **Ignition electrode/flame sensor**
    The burner flame is ignited by applying a high voltage to the ignition electrode. This causes a spark (from electrode to ground). After ignition, the electrode measures flame signal.
27. **Flame inspection window**
    The quartz glass window provides a view of the burner surface, the flame, and the ignition electrode.
28. **Flue gas dual sensor**
    This dual sensor monitors the flue gas exit temperature. The WM97+ control will shut down the boiler if flue gas temperature gets too hot. This protects the flue pipe and the heat exchanger from overheating.
29. **ON/OFF switch**
30. **Primary/secondary shut-off valve**
    Supply and return from the heating system are connected to the pipes out the top of the boiler. When p/s shut-off valve is open, the piping connection is primary/secondary, requiring a separate circulator for the system. When the valve is closed, the boiler circulator is used for boiler and system flow.
31. **Low water cut-off**
32. **Boiler circulator**
33. **Gas valve reference hose**
    This rubber line connects the gas valve diaphragm reference chamber to the venturi intake to insure the valve senses the correct reference pressure.

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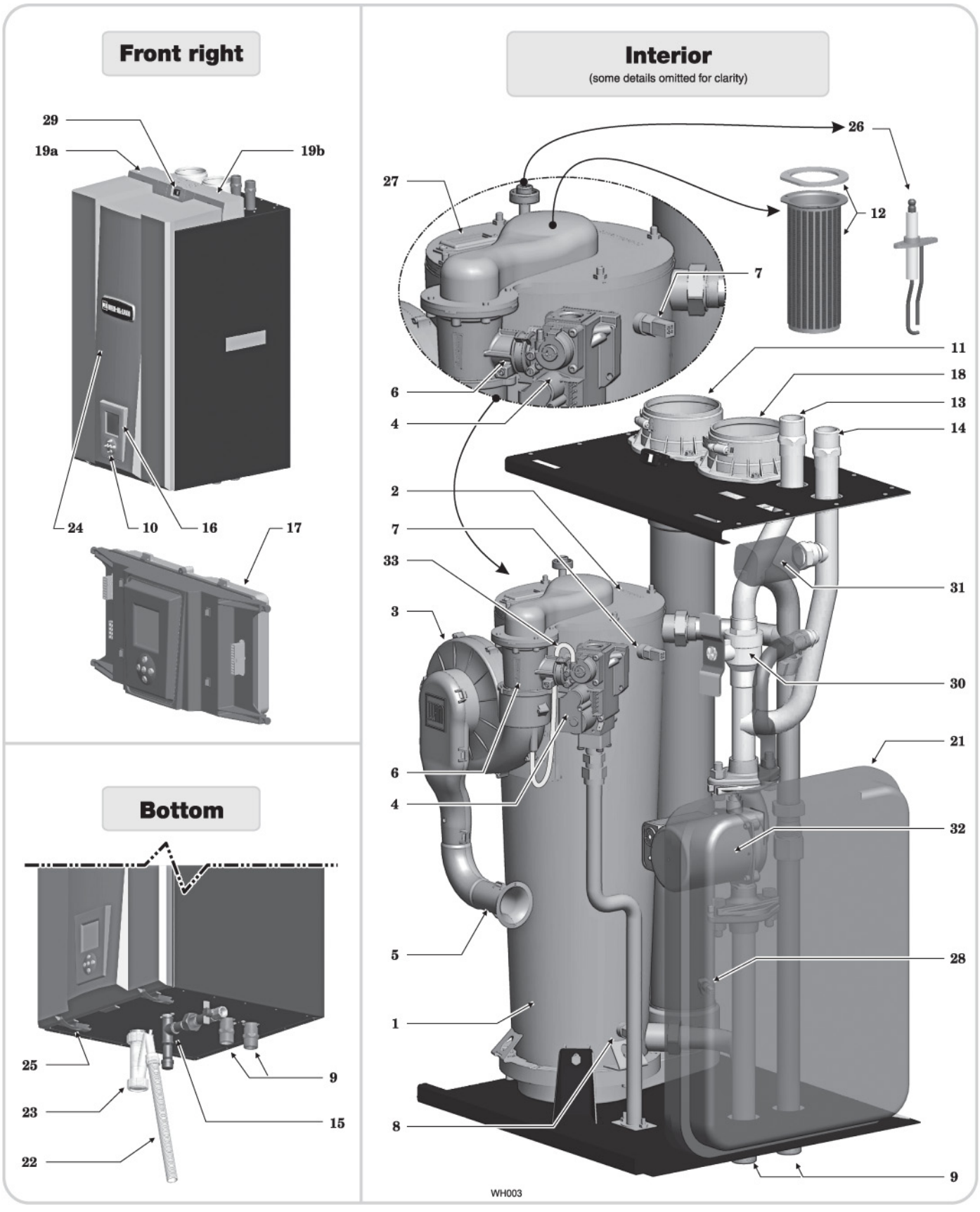
The WM97+70 & 110 Gas-fired water boiler *(cont.)*



The WM97+155 Gas-fired water boiler

1. Stainless steel firetube heat exchanger

2. Heat exchanger access cover/burner mounting plate

3. Blower

The advanced blower design and air inlet silencer on WM97+ boilers result in very quiet operation.

Air enters the boiler enclosure through the air intake adapter (18), flows through the enclosure, enters the air inlet silencer (5), then enters the blower. The blower pulls air through the silencer and the venturi (6), where it mixes with gas before entering the blower.

4. Gas valve

The automatic gas valve (4) senses the vacuum in the venturi caused by flowing air, and allows gas to flow when power is applied. A manual gas valve is shipped loose with the boiler. It allows shutting off the gas supply for servicing or shutdown. See instructions in this manual for manual gas valve installation.

5. Air inlet silencer

The horn-shaped air inlet silencer significantly reduces fan noise, providing exceptionally quiet operation.

6. Venturi

When air flows through the venturi, it creates a negative pressure. This vacuum pulls gas from the gas valve. So gas will only flow if air is flowing. The gas mixes with air in the venturi. The gas/air mixture then flows into the burner.

7. Outlet water temperature dual sensor

This dual sensor monitors boiler outlet water temperature. The WM97+ control adjusts boiler firing rate so the outlet water temperature is correct, based on the calculated (if outdoor reset used — see page 133) or fixed target temperature.

8. Return water temperature sensor

This sensor monitors return water temperature. The WM97+ control reduces or increases boiler input, depending on how close the return water temperature is to the outlet water temperature.

9. DHW tank or CWH piping connections

An indirect storage water heater can be piped to these connections for direct connection to the boiler. The installer must supply the circulator for a DHW boiler water loop. CWH (Companion Water Heater) units are shipped with a circulator.

10. Electronic display & buttons

The electronic display is used to configure boiler settings and monitor boiler operation.

The buttons allow changing display mode, selecting and adjusting control settings, and resetting the control after lockout.

11. Flue adapter (fits 3" PVC)

12. Burner

Made with high-grade stainless steel construction, the burner uses pre-mixed air and gas. The burner and control provide modulating firing.

13. Water outlet pipe (system supply)

14. Water return pipe (system return)

15. Gas connection pipe

Manual gas valve is shipped loose. Other ½" NPT gas connection pipe and fittings (including union) shown must be supplied by the installer.

16. WM97+ control

The WM97+ control responds to signals from the room thermostats, DHW aquastats (when used), boiler sensors (boiler return, boiler supply, flue temperature, and outdoor temperature, if used — see page 133). The control automatically adjusts blower speed (and gas flow rate) to match boiler output to space heating and/or DHW heating demand. The control provides for three heating zones (DHW plus two space-heating or three space heating). DHW direct-connected to the bottom piping connections can be set for domestic priority.

17. Multi-position WM97+ control housing

The WM97+ control is mounted in a plastic housing assembly that can rotate forward for rear access to the control boards or for access to boiler components. It can also be removed through slots in the boiler jacket sides.

18. Air intake adapter (fits 3" PVC)

19. Electrical entrances

The left side electrical enclosure (19a) houses the line voltage terminal block. The right side electrical enclosure (19b) houses low voltage terminals.

20. Boiler drain valve (not shown)

Shipped loose for field piping to DHW return line at bottom of boiler jacket. See instructions in this manual.

21. Boiler circulator

22. Flue gas condensate drain

Flexible plastic hose is provided to adapt to 1" PVC (fits in 1" PVC coupling).

23. Flue gas condensate drain trap assembly

The condensate trap assembly is field-installed, connected to the condensate trap nozzle as shown in this manual.

24. Front door

The front door is sealed to the boiler assembly around its entire perimeter.

25. Front door latches

Two latches secure the door in place.

26. Ignition electrode/flame sensor

The burner flame is ignited by applying a high voltage to the ignition electrode. This causes a spark (from electrode to ground). After ignition, the electrode measures flame signal.

27. Flame inspection window

The quartz glass window provides a view of the burner surface, the flame, and the ignition electrode.

28. Flue gas dual sensor

This dual sensor monitors the flue gas exit temperature. The WM97+ control will shut down the boiler if flue gas temperature gets too hot. This protects the flue pipe and the heat exchanger from overheating.

29. ON/OFF switch

30. Primary/secondary shut-off valve

Supply and return from the heating system are connected to the pipes out the top of the boiler. When p/s shut-off valve is open, the piping connection is primary/secondary, requiring a separate circulator for the system. This valve must only be closed when the boiler is connected to a multiple boiler manifold, never for a single-boiler application.

31. Low water cut-off

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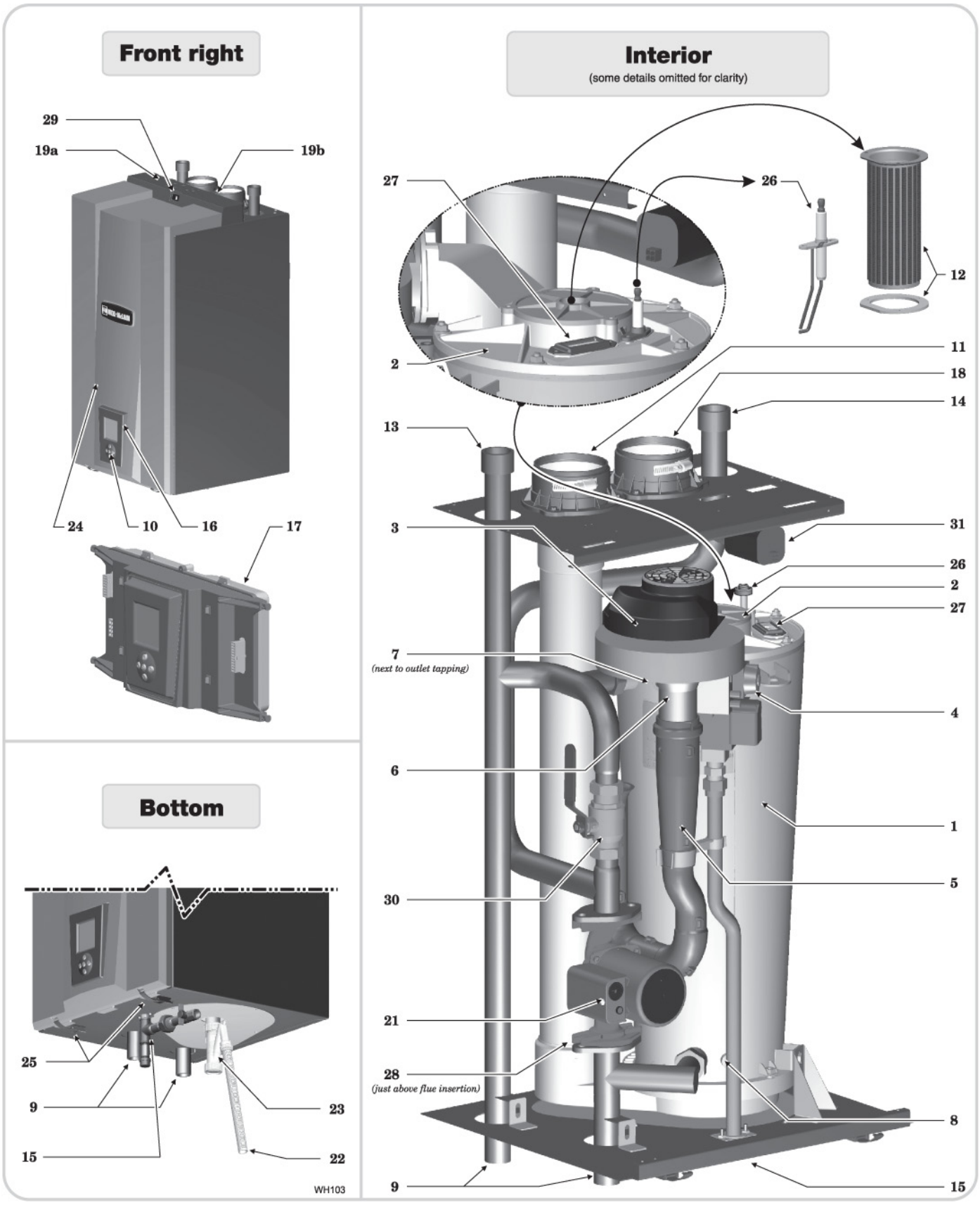
The WM97+155 Gas-fired water boiler *(continued)*



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⚠WARNING **DO NOT SERVICE THE BOILER WITHOUT A WM97+ MAINTENANCE KIT AVAILABLE**

The WM97+ maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler. Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage. See Figure 123, page 119 for part number.

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Please read before proceeding

Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

⚠ DANGER Indicates presence of hazards that will cause severe personal injury, death or substantial property damage.

⚠ WARNING Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.

⚠ CAUTION Indicates presence of hazards that will or can cause minor personal injury or property damage.

NOTICE Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

⚠ WARNING **Installer**— Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given.

User — This manual is for use only by a qualified heating installer/service technician. Refer to User's Information Manual for your reference.

User — Have this boiler serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE Write in the CP number in the space provided on the Installation certificate on page 135 if not already shown. The CP number label is located on the jacket inside upper left side, above the heat exchanger.

When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the CP number from the boiler jacket.

Consider piping and installation when determining boiler location.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Commonwealth of Massachusetts

If the boiler is installed within the Commonwealth of Massachusetts:

- This product must be installed by a licensed plumber or gas fitter.
- If antifreeze is used, a reduced pressure back-flow preventer device shall be used.
- Sidewall vent air installations — see instruction on page 22.

- **Should overheating occur or gas supply fail to shut off, DO NOT** turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- **Do not use this boiler if any part has been under water.** Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control that has been under water.

⚠ WARNING Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

EXPANSION TANK

- Relieve pressure from the system before isolating the internal expansion tank on WM97+70 or 110 boilers.

WHEN SERVICING BOILER —

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.
- This boiler contains ceramic fiber and fiberglass materials. Refer to the WARNING and instructions on page 96.

BOILER OPERATION —

- Do not block flow of combustion or ventilation air to boiler.

CARBON MONOXIDE DETECTOR —

- A carbon monoxide detector that is wired on the same electrical circuit as the boiler is strongly recommended.

SURGE PROTECTOR —

- Provide surge protection in the boiler power supply. This will reduce the possibility of damage to the boiler control.

BOILER WATER —

- The WM97+ heat exchanger is made of stainless steel, and requires that system water chemistry be within the limits in this manual. Use the inhibitor supplied with the boiler. **ADDITIONAL CHEMICAL TREATMENT MAY BE NECESSARY**. See page 87 for details.
- Thoroughly flush the system (**BEFORE** connecting boiler) to remove sediment. The high-efficiency heat exchanger can be damaged by build-up or corrosion due to sediment.

FREEZE PROTECTION FLUIDS —

- Thoroughly clean and flush any replacement boiler system that has used glycol before installing the new boiler. Use only the products listed by Weil-McLain for use with this boiler. See page 88 for details.

Boiler location

Installations must comply with:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1/NFPA 54.
- National Electrical Code.
- For Canada only: CAN/CSA B149.1, Natural Gas and Propane Installation Code, and any local codes.

NOTICE The WM97+ boiler gas manifold and controls met safe lighting and other performance criteria when boiler underwent tests specified in ANSI Z21.13 — latest edition.

Before mounting the boiler, check:

1. Wall construction — **The boiler must be wall mounted**. Make sure the wall construction is suitable to carry the weight of the boiler and components. See page 10 for instructions.
2. The boiler is suitable for INDOOR installation only.
3. Check for nearby connection to:
   - System water piping
   - Venting connections
   - Gas supply piping
   - Electrical power
   - Condensate drain
4. Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

⚠WARNING Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

5. The WM97+ boiler must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
6. If new boiler will replace existing boiler, check for and correct system problems, such as:
   - Sediment or corrosion in system piping — clean and flush piping BEFORE connecting the new boiler. See page 87.
   - System leaks causing oxygen corrosion or heat exchanger cracks from hard water deposits.
   - Incorrectly-sized expansion tank.
   - Lack of freeze protection in boiler water causing system and boiler to freeze and leak.

Residential garage installation

Precautions

1. Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage:
   - Mount the boiler with its bottom at least 18 inches above the floor. This complies with the National Fuel Gas Code, ANSI Z223.1 for U. S. installations, or CSA B149.1 and B149.2 for Canadian installations.
   - Locate or protect the boiler so it cannot be damaged by a moving vehicle.
   - Ensure that the installation complies with all applicable codes.
   - Prevent boiler water and condensate from freezing.

Provide air openings to room

WM97+ boiler alone in boiler room

1. No air ventilation openings into boiler room are needed if clearances around WM97+ boiler are at least equal to the SERVICE clearances shown in Figure 1, page 9.
2. For spaces that DO NOT supply the minimum service clearances, provide two openings as shown in Figure 1, page 9. Each opening must provide 1 square inch free area per 1,000 Btuh of boiler input.

WM97+ boiler in same space with other gas or oil-fired appliances

1. Follow the sizing requirements shown in Figure 20, page 24.

⚠WARNING The space must be provided with combustion/ventilation air openings correctly sized for all appliances located in the same space as the WM97+ boiler.

Reinstall boiler jacket front door after servicing. The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Failure to comply with the above warnings could result in severe personal injury, death or substantial property damage.

Vent and air piping

1. The WM97+ boiler requires a special vent system, designed for pressurized venting. WM97+ boilers are rated ANSI Z21.13 Category IV (pressurized vent, likely to condense in the vent). See instructions beginning on page 19.
2. You must also install air piping from outside to the boiler air intake adapter. The resultant installation is categorized as direct vent (sealed combustion). Note prevention of combustion air contamination on page 19 when considering vent/air termination.
3. Vent and air must terminate near one another unless otherwise specified in this manual. Vent and air piping may be routed vertically through the roof or out a side wall, following the options give in this manual. You may use any of the vent/air piping methods covered in this manual. Do not attempt to install the WM97+ boiler using any other means.
4. Be sure to locate the boiler such that the vent and air piping can be routed through the building and properly terminated. The vent/air piping lengths, routing and termination method must all comply with the methods and limits in instructions beginning on page 19.

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Boiler location *(continued)*

Provide clearances for service access — RECOMMENDED

1. See Figure 1 for recommended service clearances.
2. If you do not provide minimum service clearances shown, it might not be possible to service the boiler without removing it from the space.

⚠WARNING **Closet or small-enclosure installations which do not provide at least these recommended clearances require the specially-sized and placed air openings shown in Figure 2.**

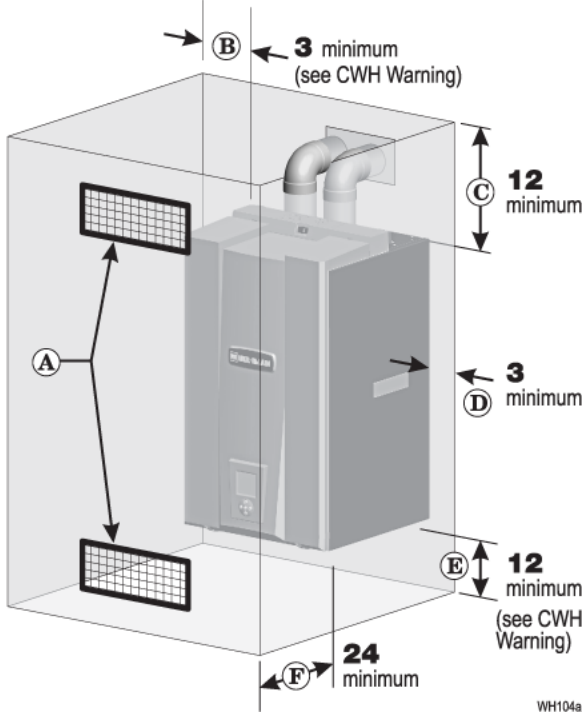
Provide clearances from combustible materials — REQUIRED

1. See Figure 2 for REQUIRED minimum clearances. ALL installation must provide at least these minimums.
2. Hot water pipes — at least ½" from combustible materials.
3. Vent pipe — at least 3⁄16" from combustible materials.
4. See Figure 1 for service clearance minimums.

⚠WARNING **Closet or small-enclosure installations which do not provide at least the recommended service clearances shown in Figure 1 require the specially-sized and placed air openings shown in Figure 2.**

⚠WARNING **Companion Water Heater (CWH)** installations — CWH units require a minimum clearance of **18 inches** on one side, right or left, for installation of the mixing valve and for clear view of the associated label. Also provide at least 1½ inches on the opposite side. Additional clearance may be needed, depending on how piping is routed. Provide these clearances to allow for future CHW installations as well as current installations. **Mount the boiler at the height specified in Figure 5, page 11.**

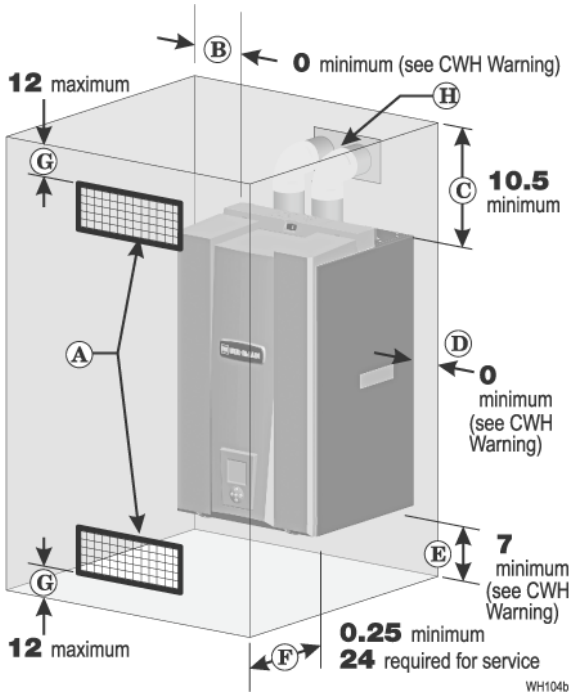
Figure 1 **RECOMMENDED** service clearances (**all dimensions are in inches**)



A	Provide combustion air/ventilation openings per Figure 20, page 24 or as otherwise directed in this manual or by applicable codes. NOTE: If the installation does not provide the minimum clearances in this illustration, then the enclosure must have air openings located and sized per Figure 2.
B	Left side service clearance = 3 inches minimum
C	Service clearance above top of boiler = 12 inches minimum
D	Right side service clearance = 3 inches minimum
E	Service clearance below the boiler = 12 inches minimum
F	Service clearance in front of the boiler = 24 inches minimum

NOTICE ADDITIONAL service clearance may be needed, depending on how piping is routed to the boiler.

Figure 2 **REQUIRED** minimum clearances (**all dimensions are in inches**)



A	Provide combustion air/ventilation openings per Figure 20, page 24 or as otherwise directed in this manual or by applicable codes. ***NOTICE*** If the installation does not provide the minimum clearances in Figure 1, then the enclosure MUST HAVE air openings located per Figure 2, above. Each of these air openings must have free area of at least 1 square inch per 1,000 MBH of boiler input.
B	Left side clearance to combustibles = 0 inches minimum
C	Top of boiler clearance to combustibles = 10.5 inches minimum
D	Right side clearance to combustibles = 0 inches minimum
E	Bottom of boiler clearance to combustibles = 5.75 inches minimum (must be 18 inches above floor for garage installations)
F	Clearance in front of the boiler = 0.5 inches, but **24 inches minimum required for service**
G	Air openings must be located in the FRONT of the enclosure, as shown. They must be no more than 12 inches from the floor or ceiling, as shown.
H	Vent pipe must be minimum 3/16 inch from combustibles. Opening in combustible wall, floor, ceiling or roof must be 3/8" larger than flue pipe diameter, fitted with galvanized steel thimble, or larger if required by codes or as specified by vent pipe manufacturer.

Wall-mounting the boiler

Remove boiler from crate

WARNING **The boiler is heavy**. Use caution not to drop the boiler or cause bodily injury while lifting and handling. Verify that the boiler is securely attached to prevent possibility of boiler falling after installation.

WARNING After the boiler is removed from the shipping carton, **DO NOT** allow the boiler to sit on its bottom. This would cause pressure on protruding pipes, resulting in interior damage. Either lay the boiler on its back on leave on the styrofoam protective shipping base.

Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

CAUTION Cold weather handling — If boiler has been stored in a very cold location (below 0°F) before installation, handle with care until the plastic components come to room temperature.

1. The WM97+ boiler is generally easier to handle and maneuver after removing the shipping container.
2. Remove items 1, 2 and 4 in Figure 3. Remove trim kit and parts from item 2.
3. **Leave the boiler resting on the styrofoam protective base** (item 5) and bottom cardboard cap (item 6), until ready to place on the wall. If removing the boiler from the shipping base, rest the boiler on its back, NOT on its bottom.

Wall-mounting requirements

WARNING DO NOT attempt to attach the wall mount bracket using anchors or any means other than directly securing to the wall studs (or equivalent wood structure if studs are not on 16-inch centers).

The wall must be vertically plumb and capable of carrying the weight of the boiler and any attached piping components.

The operating weights for wall-mountable boilers are:

WM97+70 or WM97+110: **140 pounds**

WM97+155: **150 pounds**

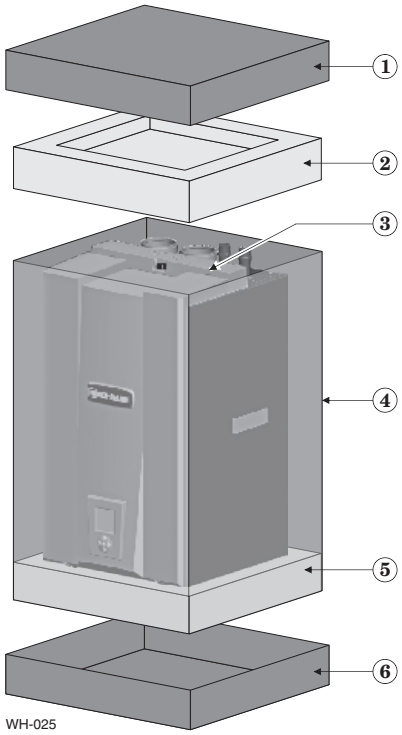
Failure to comply with above and the procedure given below could result in severe personal injury, death or substantial property damage.

1. Stud spacing: Bracket holes are spaced for studs on 16-inch centers. For other stud spacing, provide secure, solid mounting surface on which to attach the boiler wall-mounting bracket. The mounting surface must not extend above the top of the boiler jacket.
2. Wood stud wall: Install bracket and spacer board with lag screws (3/8" x 3") included in kit, only into the studs.
3. Metal stud wall: Secure bracket and spacer board to studs with 3/16-inch toggle bolts and 3/16-inch flat washers (not included with kit).

WARNING Verify that the studs are suitable for carrying a wall-mounted load. Some metal studs are not designed for this purpose.

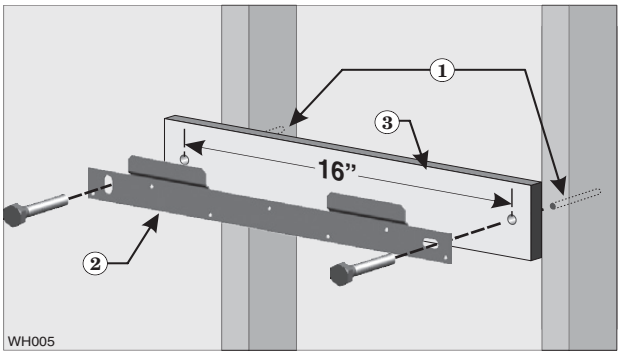
4. The boiler bracket must engage with the wall-mount bracket. Make sure the brackets are not just resting edge to edge.
5. Mount the boiler on the wall following these instructions. Perform all procedures given in the Boiler Manual on previous pages before mounting the boiler.

Figure 3 Boiler shipping container (WM97+70 shown)



1	Cardboard cap, top	**3**	Boiler
2	Styrofoam protective cap (includes compartment for trim kit and parts)	**4**	Cardboard sleeve
		5	Styrofoam protective base
		6	Cardboard cap, bottom

Figure 4 Wall-mount bracket and spacer board



1 Studs — Pre-drill through the wall into the studs ¼ inch diameter x 3 inches deep for 3/8-inch lag screws— Studs must be on 16-inch centers. If studs are any other spacing, provide a secure, solid mounting surface on which to attach the boiler wall-mounting bracket.

2 Wall-mount bracket.

3 Provide a spacer board pre-drilled with two clearance holes, spaced on 16 inch centers. Board must be **minimum** ½ inch thick by 3½" high by 18 inches long. Clearance holes (2) should be ½" diameter for 3/8-inch lag bolts or ¼" diameter for 3/16-inch toggle bolts.

Wall-mounting the boiler *(continued)*

Install the wall-mount bracket and spacer boards (by installer)

1. See Figure 4, page 10.
2. Locate the studs — must be on 16-inch centers. See previous page instructions if studs are not on 16-inch centers.
3. Provide and prepare a spacer board (item 3, Figure 4, page 10) to be installed as shown in Figure 4, page 10 and Figure 5. The board must be minimum ½ inch thick. The top edge of the spacer board must not extend higher than the top of the boiler jacket when installed.
4. Place the wall-mount bracket (item 2, Figure 4, page 10) on the wall, using a level to align correctly.
5. Place the wall-mount bracket so the mounting slots are centered over the studs.
6. Level the bracket and trace the outline of the screw slots with a pencil.
7. Remove the mounting bracket and drill holes 1/4" diameter by 3 inches deep, centered on the screw slot outlines. (For metal stud walls, using 3/16" toggle bolts, drill required clearance holes.)
8. Position the wall-mount bracket and the upper spacer board on the wall. Insert and loosely tighten the two lag screws (or toggle bolts for metal studs).
9. Level the wall-mounting bracket. Then tighten lag screws securely. For drywall or plaster lathe installations, avoid tightening so much that the space board digs into the wall surface.
10. Provide and install a lower spacer board (minimum ½ inch thick) as shown in Figure 5.

Place boiler on bracket

1. See Figure 5. The wall-mount bracket, upper spacer board and lower spacer board must be installed before mounting the boiler.
2. Measure 21 inches below the bottom edge of the wall-mount bracket (item 2). Strike a line or place a piece of masking tape with its top edge even with the 21-inch mark. (This line, or tape, will indicate whether the boiler has been properly seated onto the wall-mount bracket.)

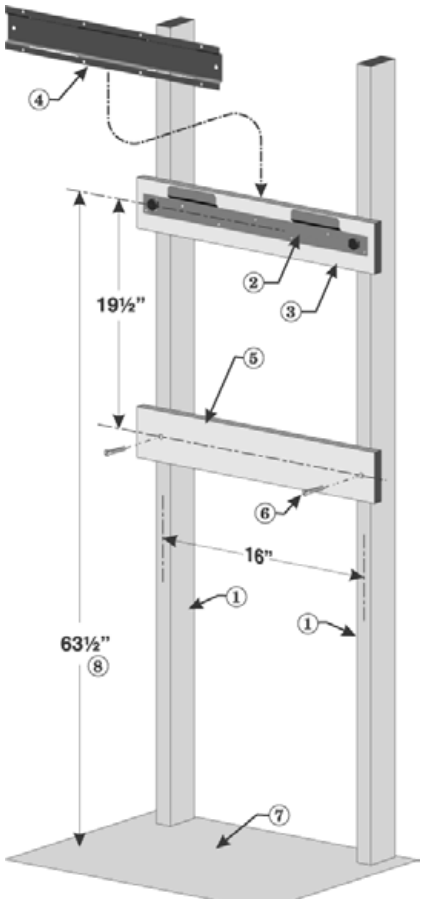
⚠WARNING **The boiler is heavy**, and requires two people to lift and place. Wear non-slip leather gloves to prevent possibility of cuts from sheet metal edges.

The jacket door can be left in place when handling the boiler, but the boiler must ONLY be lifted by the bottom and rear of the sheet metal housing — NOT by any pipe or plastic part.

3. **Obtain assistance to lift the boiler into position**.
4. Lift the boiler high enough that its rear bracket (item 4) will be above the wall-mount bracket (item 2).
5. Let the rear of the boiler slide against the lag screw heads as you lower the boiler into place.
6. When the brackets are engaged correctly, the bottom of the boiler enclosure will be at or near the pencil line, or tape, you applied in step 1.
7. If necessary, move the boiler sideways until the wall bracket tabs slip into the boiler mounting bracket slots. Adjust until the brackets properly engage and the boiler slips into the correct position.

⚠WARNING When mounting the boiler, use the method described in paragraph 2 above to ensure the brackets are properly engaged. If not, the boiler could fall. Failure to comply could result in severe personal injury, death or substantial property damage.

Figure 5 Place boiler on wall-mount bracket



NOTICE **Mounting height MUST be as shown in Figure 5 if the boiler is to be used with a Companion Water Heater (CWH) at time of installation or in the future.**

1 Studs — Pre-drill through the wall into the studs ¼ inch diameter x 3 inches deep — Studs must be on 16-inch centers. If studs are any other spacing, provide a secure, solid mounting surface on which to attach the boiler wall-mounting bracket.

2 Wall-mount bracket — secure wall mount bracket and space bar to wall as instructed on previous page.

3 Upper spacer board — must be installed as shown, per previous instructions.

4 Boiler mounting bracket — The two slots in the bracket on back of boiler must engage with the two tabs on the wall bracket. This piece is attached to the boiler. (The boiler is not shown to improve clarity.)

5 Lower space board — Provide lower spacer board pre-drilled with two clearance holes, spaced on 16 inch centers. Board must be **minimum** ½ inch thick by 3½" high by 18 inches long. Use minimum two flat-head wood screws by 2 inches long to secure the space board securely to the studs. Clearance holes should large enough to clear the shaft of the flat-head wood screws used to secure the board to the studs.

6 Flat-head wood screws by 2" long.

7 Floor surface

8 RECOMMENDED mounting height — this distance ensures room for mounting a CWH unit below the WM97+ should it ever be required

Boiler hydrostatic test

WARNING **DO NOT install a relief valve with a pressure higher than 30 PSIG**. This is the maximum allowable relief valve setting for the WM97+ boiler. Failure to comply could prevent the relief valve from operating as needed, resulting in possibility of severe personal injury, death or substantial property damage.

WARNING **Use two wrenches when tightening any pipe connection to the boiler**. Failure to prevent the boiler pipes from turning could damage pipes, resulting in possible severe personal injury, death or substantial property damage.

Hydrostatic pressure test

Pressure test the boiler before permanently attaching water or gas piping or electrical supply.

Install pipe fittings for relief valve and P/T gauge

1. Install the two 1" or 1¼" reducing tees, street ell and close nipple shipped loose with the boiler, located and oriented as shown in Figure 6, page 13.
2. Apply pipe dope to all fittings sparingly.

WARNING **DO NOT install the relief valve until after the hydrostatic test**. Temporarily install a ¾" pipe plug in the relief valve location as directed in these instructions. The plug must be removed after the test.

WARNING Because the boiler contains an internal check valve, **the relief valve must be connected ONLY on the BOILER SUPPLY OUTLET**, **NOT** the boiler return. Connect the relief valve only as shown in this manual.

Failure to comply with the above could prevent the relief valve from operating as needed, resulting in possibility of severe personal injury, death or substantial property damage.

3. Install the pressure/temperature gauge to the upper reducing tee as shown in Figure 6, page 13.

Install fittings and valves required for hydrostatic testing

1. The following piping components (supplied by installer) are required for the test configuration:
   a. Two shut-off valves (1"NPT on 70/110; 1¼" NPT on 155).
   b. Two street ells (1"NPT on 70/110; 1¼" NPT on 155).
   c. 1" NPT or 1¼" NPT pipe nipples as shown in Figure 7, page 13.
   d. ¾" NPT pipe plug.
2. **TEMPORARILY** insert a ¾" NPT pipe plug in the relief valve tapping. After the hydrostatic test, this plug must be removed and the relief valve must be installed.

Fill and pressure test

DANGER **70/110 models only: CLOSE the internal expansion tank isolation valve** before hydrostatic testing. The tank will be damaged if exposed to pressure above 42.5 PSIG.

1. CLOSE the boiler's primary/secondary by-pass valve (item 30, page 3 and page 5).
2. See Figure 7, page 13 for use with the following instructions.
3. CLOSE boiler drain valve (item 16). Connect a hose to fresh water supply and to the drain valve.
4. Place a bucket under the ends of pipe nipples (item 15 and item 17) to catch water drippage.
5. CLOSE isolation valve 12.
6. OPEN isolation valve 13.
7. Slowly open boiler drain valve (item 16) and fresh water supply to fill boiler with water. The boiler and internal piping will fill quickly because of the low water content.
8. When water begins to exit from the supply outlet nipple (item 15), close the boiler drain valve (item 16).
9. OPEN the internal primary/secondary by-pass valve (item 30, page 3 and page 5).
10. OPEN isolation valve 12. Close this valve if water begins to run from the return line nipple (item 17). Skip the next step.
11. Slowly reopen boiler drain valve until water begins to run from the return nipple (item 17). Then CLOSE isolation valve 12.
12. Continue filling until water flows from supply outlet nipple (item 15). Then CLOSE isolation valve 13.
13. When pressure on the pressure/temperature gauge reaches at least 45 PSIG, but no higher than 55 PSIG, CLOSE the boiler drain valve.
14. Hold at test pressure for 10 minutes.

WARNING Do not leave boiler unattended. A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

15. Make sure constant gauge pressure has been maintained throughout test. Check for leaks. Repair if found.

WARNING **Leaks must be repaired at once.** Failure to do so can damage boiler, resulting in substantial property damage.

WARNING Do not use petroleum-based cleaning or sealing compounds in boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.

Drain and remove fittings

1. Disconnect fill water hose from water source.
2. Drain boiler through drain valve.

WARNING Use caution when releasing pressure from the boiler. Rapid water flow could cause injury.

3. Remove hose after draining.
4. Remove nipples and valves unless they will remain for use in the system piping.
5. Remove plug and install relief valve as specified in the following WARNING.

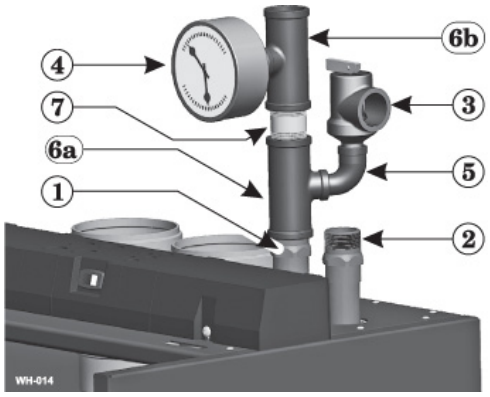
WARNING Remove plug from relief valve street elbow. Install the relief valve in the ¾" street. See page 37 to install relief valve discharge piping. Failure to install the boiler relief valve could result in severe personal injury, death or substantial property damage.

Part number 550-142-120/0113

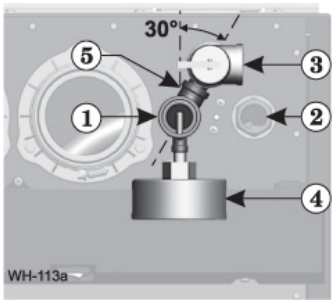
Boiler hydrostatic test *(continued)*

Figure 6 Install pipe fittings for relief valve and pressure/temperature gauge — **DO NOT mount relief valve until AFTER hydrostatic testing** *(see legend at right)*

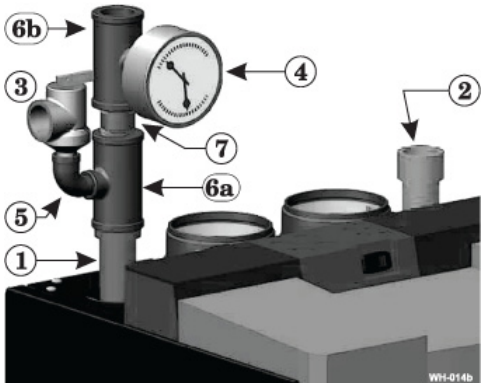
WM97+70 or WM97+110



TOP —



WM97+155



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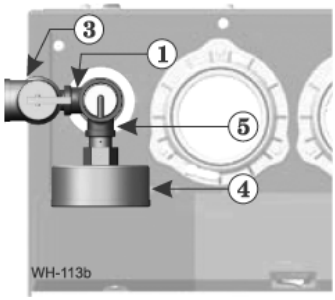
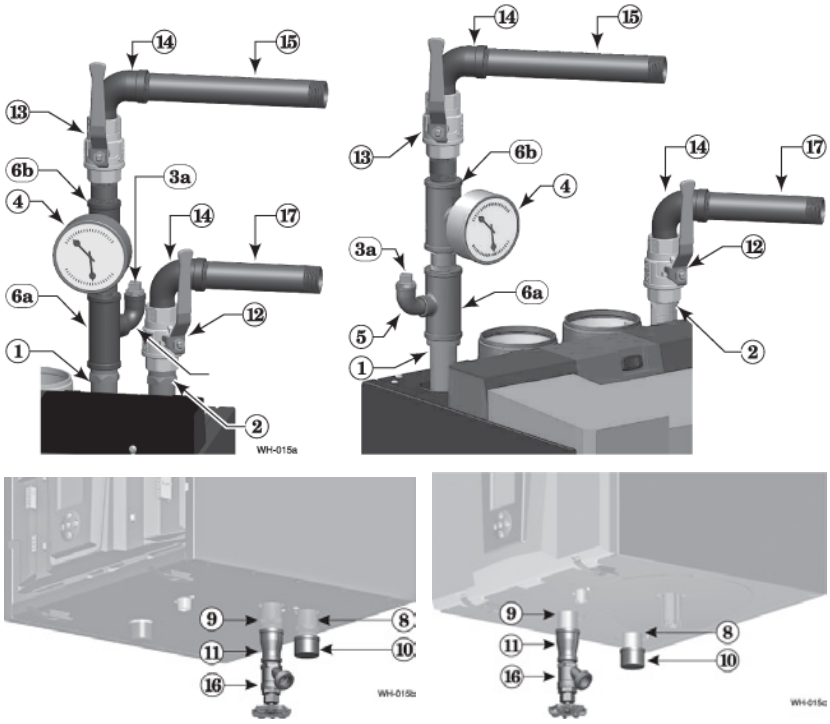


Figure 7 Install piping components required for hydrostatic test (WM97+70/110 shown) *(see legend below)*

WM97+70 or 110	*WM97+155*



1 Boiler supply (outlet) connection, (male, 1" NPT on 70/110, 1¼" NPT on 155)

2 Boiler return connection, (male, 1" NPT on 70/110, 1¼" NPT on 155)

3 Boiler relief valve, shipped loose with boiler — **DO NOT mount relief valve until AFTER hydrostatic testing**.

3a **TEMPORARILY ONLY —** Insert a ¾" NPT plug in the relief valve tapping of the street ell. **This MUST BE REMOVED after the test and the relief valve mounted here**.

4 Pressure/temperature gauge, shipped loose with boiler

5 Street ell, ¾" NPT, shipped loose with boiler, for mounting boiler relief valve
For WM97+70 or 110, rotate the street ell to about 30° off center, as shown, to allow room for the relief valve discharge piping.

6a Reducing tee, NPT, 1" x 1" x ¾" or 1¼"x1¼"x¾", shipped loose with boiler

6b Reducing tee, 1" x 1" x ¾" NPT or 1¼" x 1¼" x ¾", shipped loose with boiler

7 Nipple, 1" x close or 1¼" x close, shipped loose with boiler

8 1" NPT boiler water SUPPLY connection for DHW tank or CWH, if used. DO NOT use this connection for any application except DHW or CWH.

9 1" NPT boiler water RETURN connection for DHW tank or CWH, if used. DO NOT use this connection for any application except DHW or CWH.

10 1" NPT pipe cap, shipped loose with boiler — leave this in place if NOT connecting to DHW or CWH here; remove after hydrostatic testing to connect boiler water supply if connecting DHW tank or CWH.

11 1" x ¾" NPT reducing coupling, shipped loose with boiler — remove after testing if DHW tank or CWH is to be connected; leave in place if not connecting DHW tank or CWH.

12 isolation valve on return connection, by installer (1" NPT on 70/110, 1¼" NPT on 155)

13 isolation valve on supply connection, by installer (1" NPT on 70/110, 1¼" NPT on 155)

14 Street ells, by installer (1" NPT on 70/110, 1¼" NPT on 155)

15 Pipe nipple on supply outlet line, by installer — long enough to prevent dripping water on the boiler (1" NPT on 70/110, 1¼" NPT on 155)

16 ¾" NPT boiler drain valve, shipped loose with boiler — after hydrostatic testing, move drain valve to lowest point on the return piping if connecting to DHW tank or CWH; leave as shown if NOT using connection.

17 Pipe nipple on boiler return line, by installer — long enough to prevent dripping water on the boiler (1" NPT on 70/110, 1¼" NPT on 155)

Converting boiler to propane — WM97+70/110

Prepare boiler for propane — WM97+70/110 only (if required)

Propane operation

WARNING **ALL WM97+ boilers must be converted for propane operation**.

Converting an existing natural gas-fired boiler for propane — For a boiler already installed, you must turn off gas supply, turn off power and allow boiler to cool before proceeding. You must also completely test the boiler after conversion to verify performance and start up the boiler following instructions beginning on page 87 of this manual.

Verify 70/110 propane gas orifice bushing — See Figure 8. Verify when installing that the orifice size marking is correct. Bushings will be stamped as in illustration or with "3.85" for model 70 and "4.45" for model 110.

Failure to comply could result in severe personal injury, death or substantial property damage.

Installing propane orifice bushing — WM97+70/110 only

WARNING **If boiler is already installed** — You must turn off electrical supply to the boiler and close the external manual gas shut-off valve to isolate the boiler during conversion. Allow the boiler to cool if it has been operating.

Following conversion of an installed boiler, follow all instructions in this manual to start up the boiler and verify operation of the boiler and all system components.

1. Locate the propane orifice bushing from the propane conversion kit bag.
2. Verify that the stamping on the orifice bushing is correct for the model size (see Figure 8).
3. If the jacket front door is not already removed, remove it.
4. Locate the gas valve and venturi (see Figure 9).
5. Pull the gas valve retention ring (item 3, Figure 9) off of the gas valve/venturi joint.
6. Carefully pull the gas valve to the right until it is free of the venturi. Leave the pressure reference hose (item 4, Figure 9) connected at both ends.

Figure 8 Propane gas orifice bushing identification
WM97+70 on left (may be stamped **3.85**)
WM97+110 on right (may be stamped **4.45**)

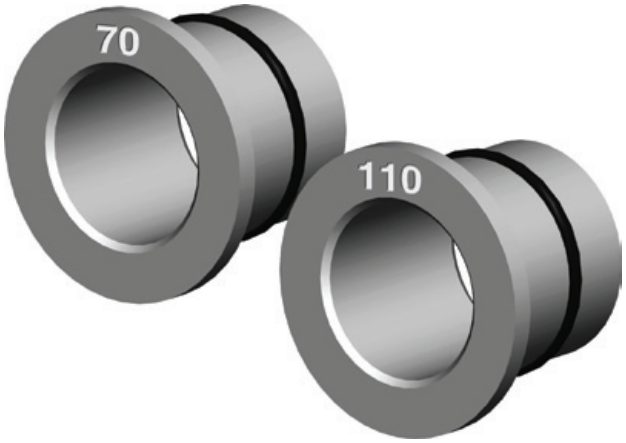
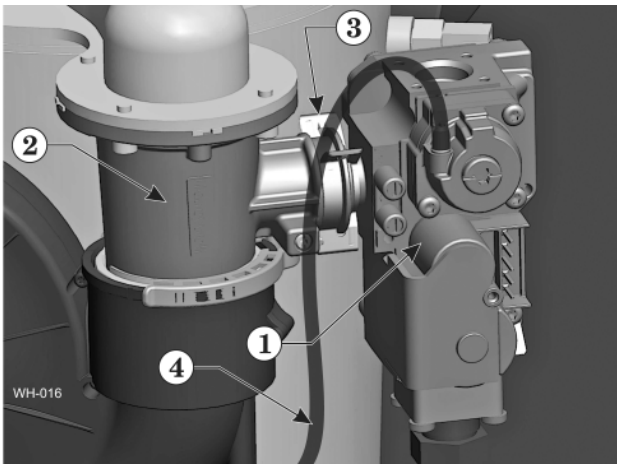


Figure 9 Gas valve and venturi

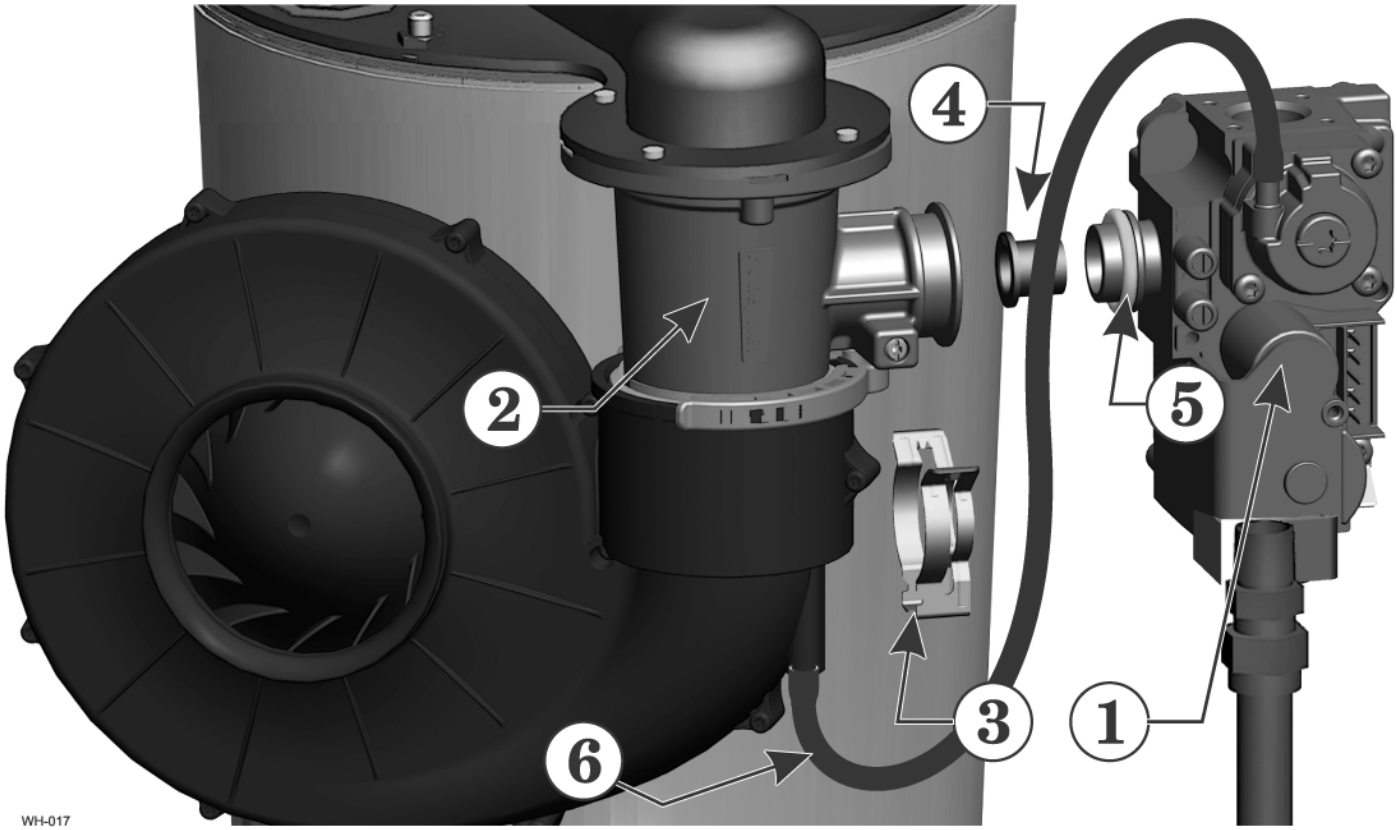


1	Gas valve
2	Venturi
3	Gas valve retention ring
4	Pressure reference hose — LEAVE CONNECTED AT BOTH ENDS

WARNING Support the gas valve after disconnecting it. DO NOT allow it to hang from the gas valve flex line. When re-attaching the gas valve, ensure the gas valve-to-venturi O-ring (item 5, Figure 10, page 15) is in place and in good condition. Inspect the gas valve flex line to ensure it is undamaged and in good condition.

Converting boiler to propane — WM97+70/110 *(cont.)*

Figure 10 Installing the propane gas orifice bushing (some details omitted for clarity)



7. See Figure 10. Insert the propane gas orifice bushing (item 4) into the gas valve outlet as shown.
8. Press the bushing into the gas valve outlet until the bushing flange butts against the gas valve outlet.

⚠ DANGER Inspect the O-rings on the propane gas orifice bushing an on the gas valve outlet (item 5, Figure 10). The O-rings must be in good condition and must be installed. Failure to comply will cause a gas leak, resulting in severe personal injury or death.

9. Reposition gas valve into the venturi and reinstall the gas valve retention ring (item 3, Figure 10).

⚠ WARNING **DO NOT ATTEMPT TO MEASURE VALVE OUTLET PRESSURE.** The valve could be damaged by manometer fluid contamination. Failure to comply could result in severe personal injury, death or substantial property damage.

10. After installation is complete, attach the propane conversion label (in conversion kit bag) next to the boiler rating plate.
11. Perform complete start-up sequence (beginning on page 87), including check for gas leaks and checking for proper operation.
12. Reinstall jacket front panel.

LEGEND for Figure 10

1 Gas valve

2 Venturi

3 Gas valve retention ring

4 Propane orifice bushing with o-ring

5 Gas valve o-ring

6 Pressure reference hose — LEAVE CONNECTED AT BOTH ENDS

⚠ WARNING **The jacket door must be in place during operation.** DO NOT operate the boiler with the jacket door removed except for inspection and testing as directed in this manual.

Converting boiler to propane — WM97+155

Prepare boiler for propane — WM97+155 only (when required)

Propane operation

WARNING **ALL WM97+ boilers must be converted for propane operation**.

Converting an existing natural gas-fired boiler for propane — For a boiler already installed, you must turn off gas supply, turn off power and allow boiler to cool before proceeding. You must also completely test the boiler after conversion to verify performance and start up the boiler following instructions beginning on page 87 of this manual.

Verify propane gas orifice size — See Figure 11. Verify when installing that the orifice size marking is correct. Orifice will be stamped as in illustration.

Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING **The jacket door must be in place during operation.** DO NOT operate the boiler with the jacket door removed except for inspection and testing as directed in this manual.

Installing propane orifice — WM97+155 only

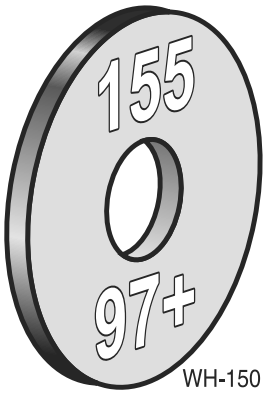
WARNING **If boiler is already installed** — You must turn off electrical supply to the boiler and close the external manual gas shut-off valve to isolate the boiler during conversion. Allow the boiler to cool if it has been operating.

Following conversion of an installed boiler, follow all instructions in this manual to start up the boiler and verify operation of the boiler and all system components.

1. Locate the propane orifice from the propane conversion kit bag.
2. Verify that the stamping on the orifice is correct for the model size (see Figure 11).
3. If the jacket front door is not already removed, remove it.
4. See Figure 12, page 17 and Figure 13, page 17 for the following.

WARNING **Support the gas valve after disconnecting from the venturi. DO NOT allow it to hang from the gas valve flex line.** When re-attaching the gas valve, ensure the gas valve grommet (item 8, Figure 13) is in place and in good condition. Inspect the gas valve flex line to ensure it is undamaged and in good condition.

Figure 11 Propane gas orifice identification WM97+155



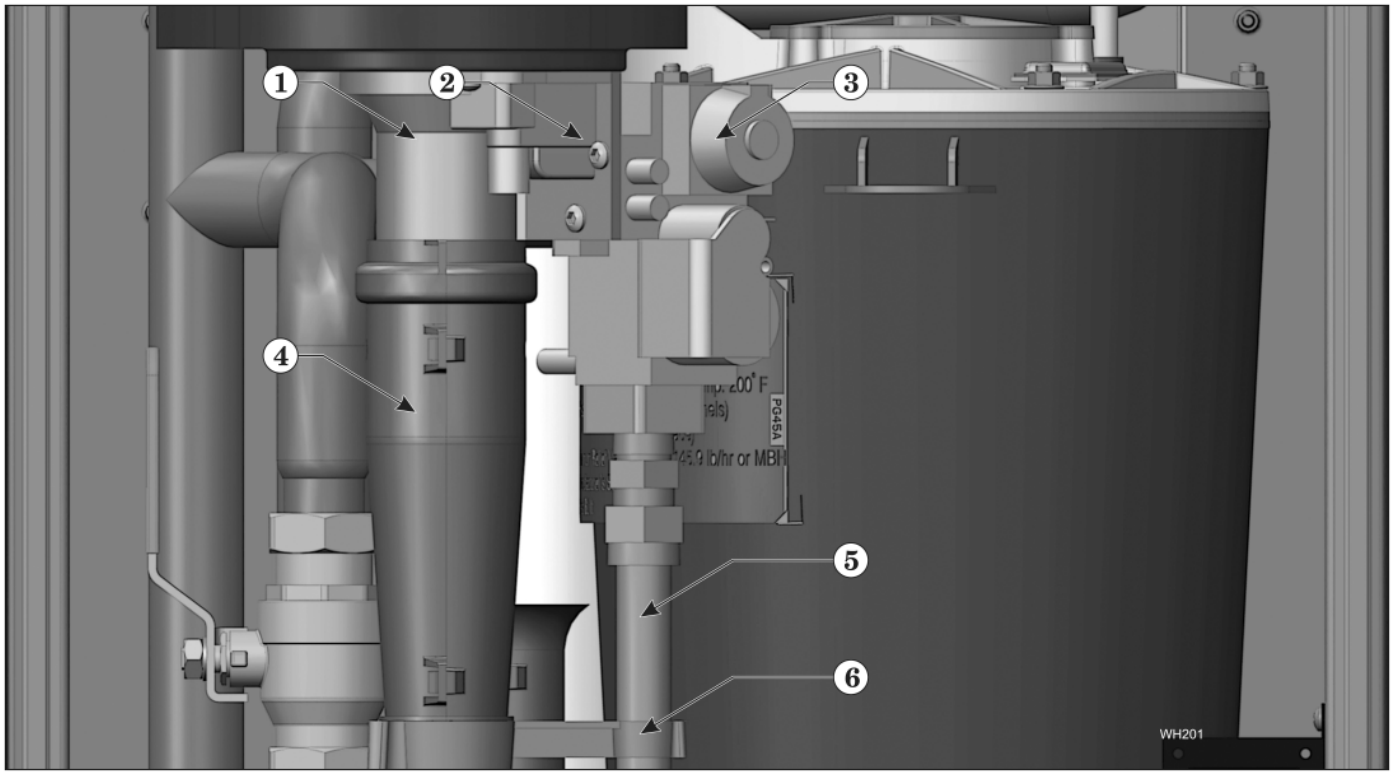
5. Locate the gas valve and venturi (items 1 and 3).
6. Release the gas line to silencer bracket (item 6) from the gas line and rotate it forward out of the way.
7. Use a 5-mm hex wrench to remove the three Allen screws (item 2) that secure the gas valve to the venturi.
8. See Figure 13, page 17. Carefully pull the gas valve to the right until it is free of the venturi. Securely support the gas valve — DO NOT leave it dangling.
9. Insert the propane gas orifice (item 7) into the gas valve opening as shown in Figure 13, page 17.
10. Make sure that the rubber grommet (item 8) is firmly seated in the gas valve opening.

DANGER When re-attaching the gas valve, ensure the gas valve grommet (item 8, Figure 13) is in place and in good condition. Failure to comply will cause a gas leak, resulting in severe personal injury or death.

11. Reposition gas valve onto the venturi and reinstall the gas valve retention screws (item 2).

Converting boiler to propane — WM97+155 *(cont.)*

Figure 12 Installing the propane gas orifice bushing (some details omitted for clarity)



LEGEND for Figure 12 amd Figure 13

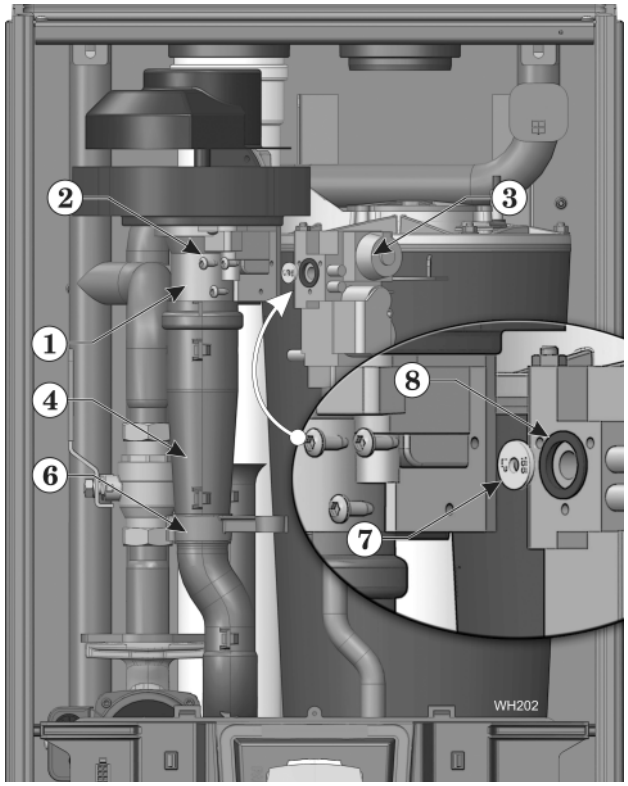
1. Venturi (leave venturi attached to blower)
2. (3) hex-head screws, 5 mm hex (remove and retain)
3. Honeywell gas valve
4. Air silencer (leave connected to venturi)
5. Flexible gas line
6. Gas line to silencer bracket (rotate forward before disconnecting gas valve from venturi
7. Propane orifice (in propane conversion kit envelope)
8. Rubber grommet (must be installed in valve for all applications) — make sure grommet is properly seated in valve before inserting the propane orifice

12. Swing the gas line to silencer bracket (item 6) back into position and snap onto the gas line.

⚠WARNING **DO NOT ATTEMPT TO MEASURE VALVE OUTLET PRESSURE.** The valve could be damaged by manometer fluid contamination. Failure to comply could result in severe personal injury, death or substantial property damage.

13. After installation is complete, attach the propane conversion label (in conversion kit bag) next to the boiler rating plate.
14. Perform complete start-up sequence (beginning on page 87), including check for gas leaks and checking for proper operation.
15. Reinstall jacket front panel.

Figure 13 Gas valve and venturi



Gas piping — sizing gas lines

NOTICE Boiler gas connection is ½" NPT. Size gas lines large enough to provide gas to all connected appliances.

Natural Gas:

Pipe sizing for natural gas

1. Size gas piping from meter outlet to entrance of boiler in accordance with Figure 14 and Figure 15.
2. Use total input of all connected appliances. Divide total input in Btuh by 1,000 to obtain cubic feet per hour of natural gas.
   a. Pipe lengths in Figure 14 are equivalent length of straight pipe. Convert pipe fittings to equivalent lengths using data from Figure 15.
   b. Figure 14 is only for natural gas with specific gravity 0.60, with a pressure drop through the gas piping as listed in the table.
   c. For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 or B149.2 for Canadian installations).

Natural gas supply pressure

1. Pressure required at gas valve inlet pressure port:
   a. Maximum: 13" (330 mm) w.c. with no flow (lockup).
   b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire):
   WM97+70: 3½" (89 mm) w.c.
   WM97+110: 4½" (114 mm) w.c.
   WM97+155: 3½" (89 mm) w.c.
2. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 13" w.c. at any time. Adjust lockup regulator for 13" w.c. maximum.

Propane Gas:

⚠WARNING You must follow the instructions, beginning on page 14, to operate the boiler on propane. Failure to comply could result in severe personal injury, death or substantial property damage.

Pipe sizing for propane gas

1. Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.

Propane supply pressure

1. Adjust propane supply regulator provided by gas supplier for 13" (330 mm) w.c. maximum pressure.
2. Pressure required at gas valve inlet pressure port:
   a. Maximum: 13" (330 mm) w.c. with no flow (lockup).
   b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire):
   WM97+70: 3½" (89 mm) w.c.
   WM97+110: 4½" (114 mm) w.c.
   WM97+155: 3½" (89 mm) w.c.

Figure 14 Pipe capacity for 0.60 specific gravity natural gas; pipe length is in equivalent feet

Gas pipe total length, feet	Capacity Cubic feet per hour, natural gas, 0.60 specific gravity Gas pressure 13" (330 mm) w.c. or less Pressure drop 0.3 inches (7.6 mm) w.c.						
	½"	¾"	1"	1¼"	1½"	2"	2½"
10	132	278	520	1050	1600	3050	4800
20	92	190	350	730	1100	2100	3300
30	73	152	285	590	890	1650	2700
40	NA	130	245	500	760	1450	2300
50	NA	115	215	440	670	1270	2000
75	NA	105	175	360	545	1020	1650
100	NA	96	150	305	460	870	1400
150	NA	90	120	250	380	710	1130

Figure 15 Equivalent lengths of straight pipe for typical gas line fittings

Pipe size inches	Equivalent length, feet			
	90° Elbow		Tee	
	short radius	long radius	line flow	branch flow
½	3.6	2.2	1.7	4.2
¾	4.4	2.3	2.4	5.3
1	5.2	2.7	3.2	6.6
1¼	6.6	3.2	4.6	8.7
1½	7.4	3.4	5.6	9.9
2	8.5	3.6	7.7	12.0
2½	9.3	4.0	9.3	13.0

Venting/air piping — general

⚠ DANGER Do not install the WM97+ boiler into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

⚠ WARNING Existing common vent systems may be too large for the appliances remaining connected after the existing boiler is removed.

⚠ WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

When removing a boiler from an existing common vent system

The WM97+ boiler cannot be common vented with any other appliance. When an existing boiler is replaced with an WM97+ boiler, the WM97+ boiler CANNOT use the existing common vent. The WM97+ boiler requires its own vent and air piping, as specified in this manual. This may cause a problem for the appliances that remain on the old common vent, because the vent may be too large. The following test is intended to check for proper operation of the appliances remaining on the old common vent system.

Vent system verification

Perform the test sequence below for **each** appliance remaining on the original common vent system. Operate each appliance individually, with other appliances turned off. This procedure will test whether the common vent system can properly vent each appliance.

Existing vent test procedure

(The following is intended to test whether the appliances remaining on an existing vent system will operate satisfactorily.)

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
3. Test vent system — Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 — latest edition. Correct by re-sizing to approach the minimum size as determined using the appropriate tables in Part 11 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

⚠ WARNING **You must pipe combustion air to the boiler air intake**.

Install air inlet piping for the WM97+ boiler as described in this manual.

The air termination fitting must be installed with the clearances and geometry relative to the vent outlet depicted in this manual to ensure that flue products do not enter the air intake.

Ensure that the combustion air will not contain any of the contaminants in Figure 16. Do not pipe combustion air near a swimming pool, for example. Avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

Figure 16 Corrosive contaminants and sources

Products to avoid
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
Excessive dust and dirt

Areas likely to have contaminants
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops

Venting & air — general *(cont.)*

Figure 17 WM97+ venting and air piping — DIRECT VENT ONLY — OPTIONS and PIPING LIMITS

NOTICE The table below lists the acceptable vent/air pipe terminations described in this manual. Follow all instructions provided to install the vent/air system. **NOT SHOWN** below, but also approved, are the polypropylene piping and terminations listed in Figure 18, page 21. For these applications, use ONLY the manufacturers' parts listed and follow all instructions provided by the pipe manufacturer.

Maximum vent and air pipe length = 100 feet for all applications

(Minimum length for all applications is 2 feet)

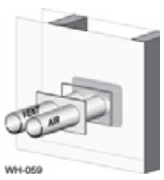
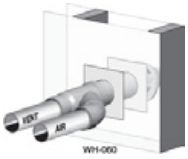
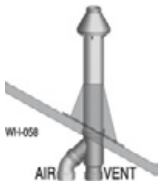
(All applications include allowance for the termination fittings plus one elbow in air piping and one elbow in vent piping)

USE SWEEP ELBOWS ONLY

See Figure 18, page 21 for material specifications | See Figure 123, page 119 for part/kit numbers

Vent and air pipe sizes:

Maximum vent lengths apply for either 2" or 3" vent and air pipe.
If using 2" pipe, provide 3"x2" reducers at boiler connections and at Weil-McLain vent/air cap or at concentric terminations.
Boilers will derate as vent/air pipe length increases — see rating data on Figure 137, page 133 for derate amounts.

WM97+ Model	**SIDEWALL** termination						**VERTICAL** termination			
	3" Weil-McLain PVC vent/air cap [Note 1]		Separate pipes [Note 1]		PVC or PP Concentric [Note 1]		Separate pipes [Note 1]		PVC or PP Concentric [Note 1]	
										
	See page 25		See page 27		See page 29		See page 31		See page 33	
	Size, inches	Materials Fig. 18, page 21	Size, inches	Materials Fig. 18, page 21	Size, inches	Materials Fig. 18, page 21	Size, inches	Materials Fig. 18, page 21	Size, inches	Materials Fig. 18, page 21
70	**2**	PVC/PVC-DWV CPVC, PP, SS	**2**	PVC/PVC-DWV CPVC, PP, SS	**2**	PVC/PVC-DWV CPVC, PP, SS	**2**	PVC/PVC-DWV CPVC, PP, SS	**2**	PVC/PVC-DWV CPVC, PP, SS
	3	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS
110	**2**	CPVC, PP or SS ***ONLY***	**2**	CPVC, PP or SS ***ONLY***	**2**	CPVC, PP or SS ***ONLY***	**2**	CPVC, PP or SS ***ONLY***	**2**	CPVC, PP or SS ***ONLY***
	3	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS
155	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, SS, **	**3**	PVC/PVC-DWV CPVC, PP, SS	**3**	PVC/PVC-DWV CPVC, SS, **

** Model 155 may be concentric sidewall vented (NOT vertical concentric vented) using Centrotherm polypropylene pipe (Eco Systems InnoFlue® Single-wall) ONLY if using Centrotherm stainless steel concentric termination kit, part number ICWS3513.

⚠WARNING All elbows in vent and air piping must be sweep elbows ONLY. DO NOT use short-radius elbows.

Equivalent feet for elbows (USE SWEEP ELBOWS ONLY) — deduct from max equivalent length of piping (does not apply to termination fittings)

- 7 feet per for each additional 90° sweep elbow or 45° elbow — If piping contains more than 1 elbow in air or vent piping, other than termination fittings

Note 1:

Material abbreviations: PP = polypropylene, SS = AL29-4C stainless steel

If using polypropylene or stainless pipe, provide adapters to for 3" boiler connections and for terminations, if required

IPEX 3" PVC concentric vent kits can be used with standard PVC pipe, fittings and cement (ANSI/ASTM D1785) except if ULC S636 compliance is required. For ULC S636 compliance, all pipe, fittings and cement must be IPEX System 636. If using IPEX kits, use only IPEX product code 196006 for 3" venting.

Contact Weil-McLain for ordering information and availability of Weil-McLain venting kits.

Venting & air — general *(cont.)*

Figure 18 Vent and air piping materials — Use only the materials listed below, ensuring that all materials meet local codes (see Figure 123, page 119 for part/kit numbers)

Item	Material	Standards for installations in:		
		United States	Canada (Note 2)	
Plastic piping materials		**Vent or air piping**	**Vent piping**	**Air piping**
Vent or air pipe & fittings	PVC schedule 40	ANSI/ASTM D1785	ULC S636	PVC, PVC-DWV, CPVC or polypropylene
	PVC-DWV schedule 40 (Note 1)	ANSI/ASTM D2665	NA	
	CPVC schedule 40 (Note 1)	ANSI/ASTM F441	ULC S636	
PVC & ABS pipe cement & primer	PVC	ANSI/ASTM D2564/F656	ULC S636	Use only cement and primer suitable for piping material used
	CPVC (Note 1)	ANSI/ASTM F493	ULC S636	
Polypropylene vent pipe, fittings, terminations and cement	**Simpson-Duravent —** Obtain all materials from M&G Simpson-Duravent **Centrotherm Eco Systems InnoFlue® Single-wall —** Obtain all materials from Centrotherm	See manufacturer's literature for detailed information ***MUST USE LOCKING COLLAR ON EVERY JOINT***	ULC S636	PVC, PVC-DWV, CPVC or polypropylene
AL29-4C stainless steel piping materials				
Vent pipe AL29-4C stainless steel	Heat Fab, Inc. — Saf-T-Vent® Z-Flex, Inc. — Z-Vent II Dura-Vent — FasNSeal™ Metal-Fab, Inc. — CORR/GUARD Centrotherm Eco Systems — InnoFlue®	Certified for Category IV and direct vent appliance venting	Certified for Category IV and direct vent appliance venting	
Weil-McLain stainless steel bird screens, 2" or 3" *(purchase separately) — see Figure 123, page 119 for part numbers*				

Note 1: Weil-McLain concentric vent kits are made from PVC pipe and fittings.

Note 2: System 636 PVC concentric terminations utilize PVC pipe/fittings certified to ULC S636. If ULC S636 compliance is required, use only System 636 pipe, fittings and cement.

⚠WARNING DO NOT mix piping from different pipe manufacturers unless using adapters specifically designed for the purpose by the manufacturer.

⚠WARNING Every joint on **polypropylene vent piping must** include a locking collar.

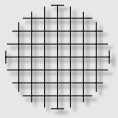
⚠WARNING DO NOT use cellular core pipe.

⚠WARNING ADAPTERS — AL29-4C piping — Install a PVC-to-stainless adapter supplied by the AL29-4C stainless pipe manufacturer at the 3" PVC boiler vent connection and at the termination (if using Weil-McLain plate or concentric PVC termination).

ADAPTERS — Polypropylene piping — Provide adapters from polypropylene pipe to the 3" PVC connections at the boiler and at terminations, if required (Weil-McLain sidewall plate, for example).

ADAPTERS — If using 2" piping, where approved for the application, provide adapters for the 3" PVC boiler connections and at the terminations, if required (Weil-McLain sidewall plate, for example)

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



⚠WARNING **ALL** vent and air pipes require a **BIRD SCREEN at each termination**. Most kits do not include the bird screens. Purchase bird screens separately from Weil-McLain or vent kit supplier if not included. [Note — bird screening is integral to the 3" PVC Weil-McLain sidewall vent cap, supplied standard with all WM97+ boilers. No additional screening is required.]

Commonwealth of Massachusetts installations

Commonwealth of Massachusetts — When the boiler is installed within the Commonwealth of Massachusetts, the boiler must be installed by a licensed plumber or gas fitter. Read and comply with the instructions below.

(a) For all sidewall horizontally-vented gas-fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors
   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. **APPROVED CARBON MONOXIDE DETECTORS**. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. **SIGNAGE**. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS."
4. **INSPECTION**. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.

(b) **EXEMPTIONS**: The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:
1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED**. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:
1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED**. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:
1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

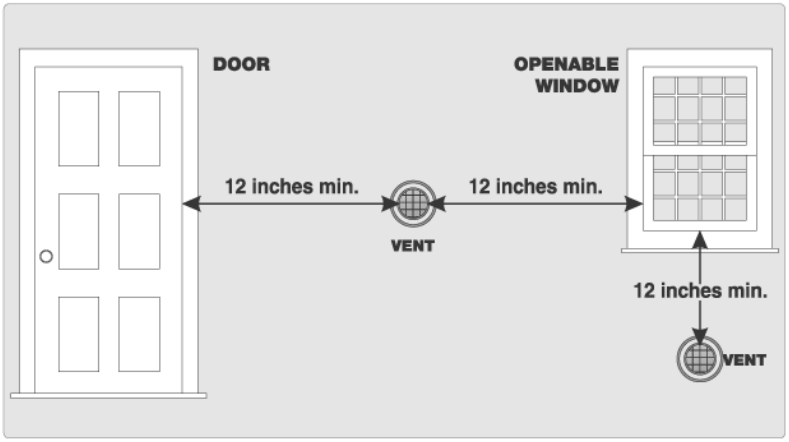
(e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

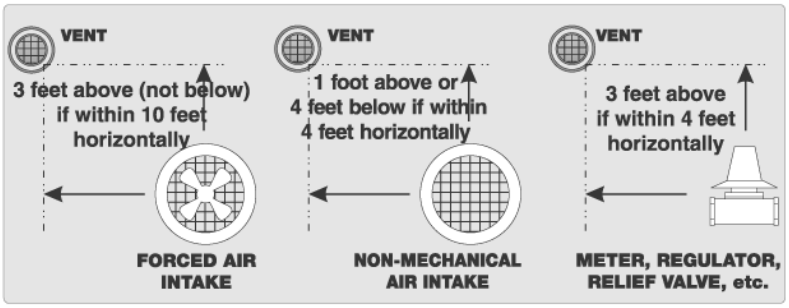
Vent termination requirements

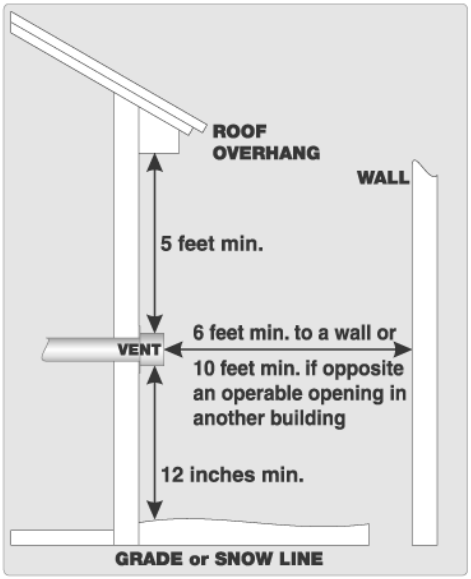
Figure 19 The vent termination must be located to meet all requirements below (also applies to vertical vent terminations). For Canadian installations, defer to the requirements of CSA B149.1 or B149.2 Installation Code.

WH-026

MINIMUM CLEARANCES

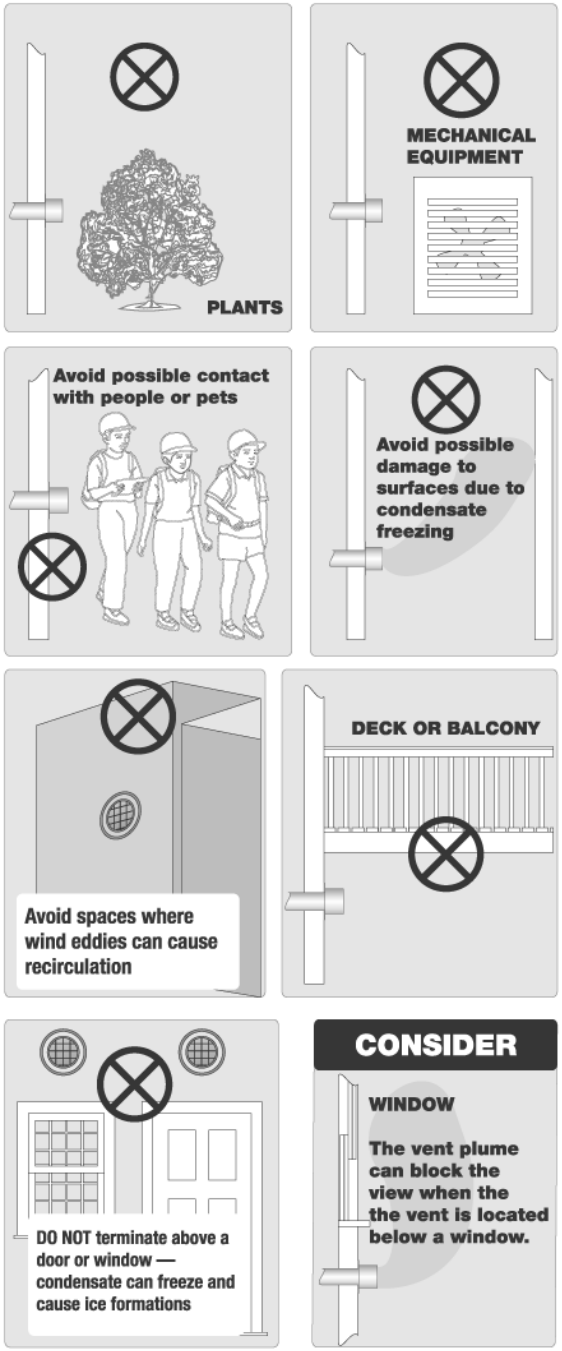






DO NOT TERMINATE:

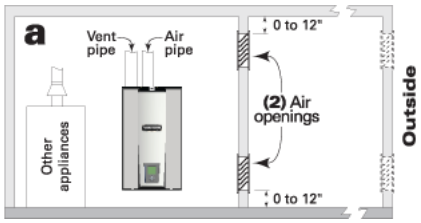
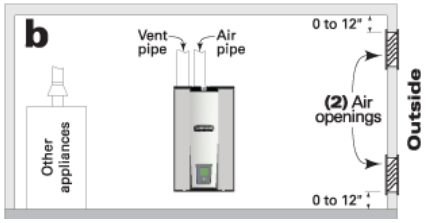
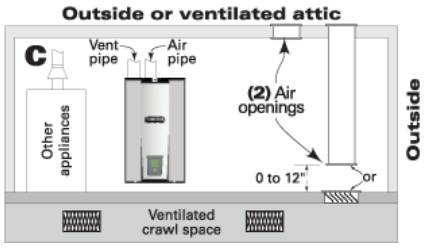
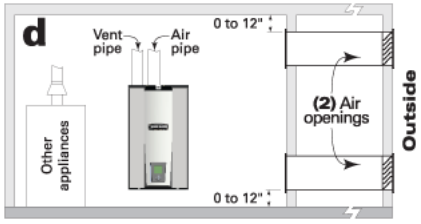
DO NOT TERMINATE:



Boiler room air openings

Figure 20 Combustion and ventilation air openings for WM97+ Direct Vent installations

⚠WARNING The WM97+ boiler CANNOT be in the same space with other appliances if clearances around the WM97+ are less than the recommended service clearances shown in Figure 1, page 9.

Air openings The required air opening sizes below are FREE AREA, after reduction for louver obstruction. Note the exception below for large spaces.	**WM97+ boiler WITH other appliances in room**	**WM97+ boiler WITHOUT other appliances in room**
	**TWO** openings, each at least: **1** square inch per **1,000** Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)	**NO** openings are required if the boiler installation provides at least the recommended service clearances shown in Figure 1, page 9. ***If the space is smaller than Figure 1, page 9, provide openings ONLY as shown in Figure 2, page 9***. Each opening must have a free area no less than 1 square inch per 1,000 Btuh input of the boiler.
	**TWO** openings, each at least: **1** square inch per **4,000** Btuh of all other appliances in the room — OR — **ONE** opening **, each at least: **1** square inch per **3,000** Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)	
	**TWO** openings, each at least: **1** square inch per **4,000** Btuh of all other appliances in the room — OR — **ONE** opening **, each at least: **1** square inch per **3,000** Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)	
	**TWO** openings, each at least: **1** square inch per **2,000** Btuh of all other appliances in the room — OR — **ONE** opening **, each at least: **1** square inch per **3,000** Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)	
**** NOTICE:** **Requirements for using the SINGLE air opening option.**	A single combustion air opening can be used for cases b, c or d above (WM97+ with other appliances in room only), sized as listed, provided that: • The single opening must communicate directly to the outdoors or to a space that communicates directly with outdoors (NOT to an interior space). • The top of the opening must be within 12 inches of the ceiling. • The free area of the opening must be at least equal to the sum of the areas of all equipment vent connectors in the space.	
SPECIAL EXCEPTION FOR LARGE SPACES (WM97+ WITH other appliances in room only):	NO combustion air openings are needed if the boiler (and other appliances) are installed in a space with a volume NO LESS than 50 cubic feet per 1,000 Btuh of all appliances in the space. That is, total the input of all appliances in MBH (1,000's of Btuh), then multiply this total times 50. The building MUST NOT be of tight construction. Example: For a total input of 500 MBH (500,000 Btuh), the minimum volume would be 50 x 500 = 25,000 cubic feet.	

DIRECT VENT — Sidewall with W-M vent/air plate

Allowable vent/air pipe materials & lengths

⚠WARNING Use only the vent materials and kits listed in Figure 18, page 21. Provide pipe adapters if specified.

1. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 17, page 20.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler vent and air connections and at the vent termination. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler and at the vent and air terminations. (The air pipe must be PVC or CPVC.)

Determine termination location

1. The vent/air cap must be installed as shown in Figure 24, page 26.
2. The termination must comply with clearances and limitations shown in Figure 19, page 23.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

Multiple vent/air terminations or termination adjacent to other appliance terminations

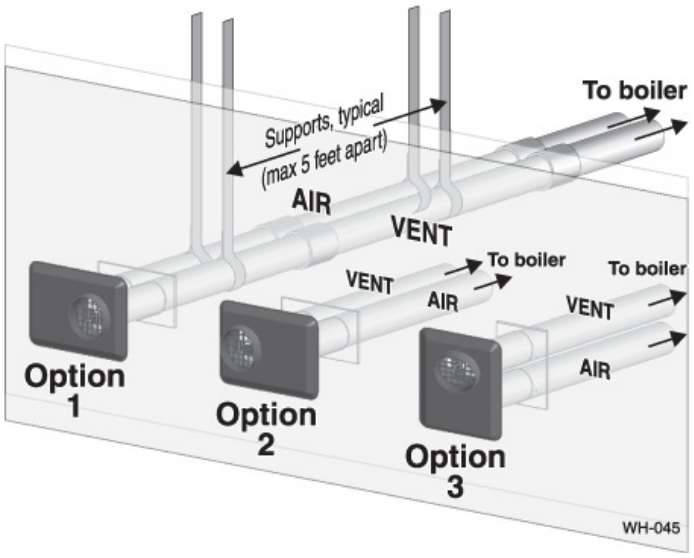
1. When terminating multiple WM97+ boilers, terminate each vent/air connection as described in this manual.

⚠WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearance as shown in for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit..
3. The air inlet of a WM97+ boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

⚠WARNING For terminations of other appliances, provide at least the clearance shown . The installation must also comply with the manual for the other appliances.

Figure 21 INSTALLATION — W-M sidewall vent/air plate



Vent/air pipes and vent/air can be oriented as option 1, 2, or 3. DO NOT mount with plate vertical and vent outlet down.

Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 19 through page 24.** Polypropylene AL29-4C S.S. See notices at left.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected sidewall termination location complies with Figure 19, page 23. (Multiple boiler sidewall plates must also comply with .)

Step 4 Use only the vent materials listed in Figure 18, page 21. Provide pipe adapters where required.

Step 5 Vent piping and air piping lengths must not exceed the values shown in Figure 17, page 20.

Step 6 Prepare the sidewall penetrations and secure the sidewall plates as instructed in this section. See "Install Weil-McLain vent/air cap" on page 26.

Step 7 The Weil-McLain plate termination must be installed before piping from the boiler to the termination.

Step 8 Install vent and air piping between the boiler and the vent/air termination plate. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 36 for general guidelines.

Step 9 Install pipe supports every 5 feet on both the horizontal and vertical runs, or per vent pipe manufacturer's instructions. Polypropylene AL29-4C S.S. See notices at left.

Step 10 Install a hanger support within 6 inches of any upturn in the piping, or per vent pipe manufacturer's instructions. Polypropylene AL29-4C S.S. See notices at left.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

DIRECT VENT — Sidewall with W-M vent/air plate *(continued)*

Install Weil-McLain vent/air cap

WARNING **ADAPTERS** — Use adapters if using other than 3-inch PVC or CPVC. This is required for different materials (polypropylene or AL24-4C stainless steel) or if using 2-inch pipe.

NOTICE The inside and outside cover plates are stamped to identify the exhaust (vent) and intake (air) openings. Make sure to orient the plates correctly.

1. Locate termination opening and avoid obstructions:
   a. Use the template supplied with the termination kit.
   b. Locate the template on the outside building surface where the penetration is to be made.
   c. Make sure there will be no obstructions that might prevent proper placement of the termination.
   d. Use the template to mark the locations for the four mounting holes, flue pipe and air pipe. Level the template with a level.

WARNING For the Weil-McLain plate, the template must be level to ensure the flue and air pipe will be side-to-side, as shown in Figure 23. Failure to comply could result in severe personal injury, death or substantial property damage.

   e. Cut holes in the wall as shown in Figure 23, using the location marks made with the template. For best results, use a small-diameter, long drill bit to drill centering holes for the flue and air pipe openings. Then drill the large openings from both the inside and outside.
   f. The flue pipe and air pipe may be run through a rectangular cutout (as marked on the template) in lieu of two separate holes if desired.
2. Drill holes for the screws or plastic anchors to secure the outside plate. Install the outside plate and mount the termination on the plate (temporarily).
   a. Cut the flue pipe so the extension through the wall will cause the vent pipe to fully extend into the termination socket.
   b. Cut the air pipe so the extension through the wall will butt the air pipe against the stops inside the termination.
   c. Temporarily slide the flue and air pipes through the opening(s). Slide the inside wall plate over the two pipes and into position on the inside wall.
   d. Position the inside plate so the flue pipe and air pipe slope downward slightly toward the boiler (1/4" per foot).
   e. Mark the four (4) mounting holes for the plate.
   f. Remove the vent and air pipe, drill the four mounting holes, and mount the inside plate.
3. Test fit the vent/air termination on the vent pipe. Make sure the vent pipe fully penetrates the termination socket and the air pipe butts against the interior stops.
4. Apply silicon RTV sealant to the interior of the vent termination and slide onto vent pipe. Rotate slightly to spread the silicon to ensure a tight seal around the vent pipe.
5. Secure the termination in place using the four #10 x ½" sheet metal screws and lock washers (see Figure 24).

NOTICE Vent/air pipes and W-M vent/air plate can be oriented in any of the configurations shown in Figure 21, page 25.

Figure 22 Adjacent terminations — OUTSIDE VIEW — clearance from air inlet to exhaust from another appliance

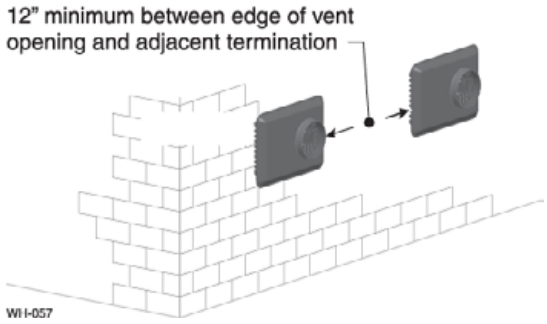
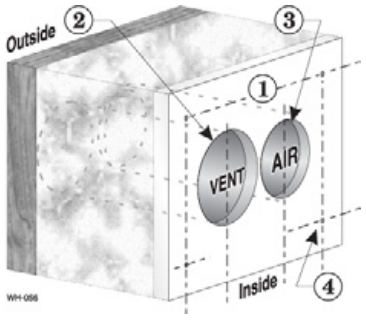
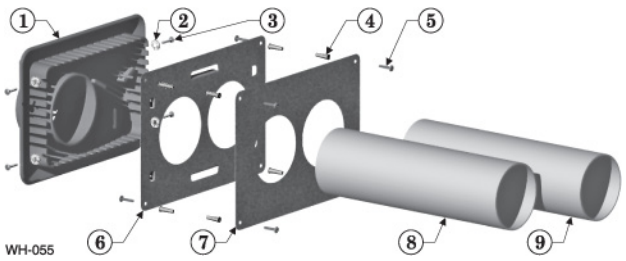


Figure 23 Hole preparation in wall — INSIDE VIEW (use template provided)



1	Inside wall
2	Drill: 3½" diameter for 3" air pipe; locate using template provided
3	For combustible materials, drill: 4" diameter for 3" vent pipe For noncombustible materials, drill 3½" diameter for 3" vent pipe Locate opening using template provided
4	Drill mounting screw holes using template provided

Figure 24 Termination assembly — INSIDE VIEW Weil-McLain vent/air cap and plates



1	Vent termination (3")	6	Outer mounting plate
2	Lock washer, #10 (4)	7	Inner mounting plate
3	Sheet metal screw, #10 x ½" (4)	8	Vent pipe (butt to screen in termination)
4	Plastic wall anchor (8)	9	Air pipe (butt to stops in termination)
5	Sheet metal screw, #10 x 1¼" (8)		

DIRECT VENT — Sidewall with separate pipes

Allowable vent/air pipe materials & lengths

⚠WARNING Use only the vent materials and kits listed in Figure 18, page 21. Provide pipe adapters if specified.

1. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 17, page 20.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler vent and air connections. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition piece at the boiler vent connection. The air piping must be PVC or CPVC. Provide a 3" PVC transition piece at the boiler air connection if using 2" air piping.

Determine termination location

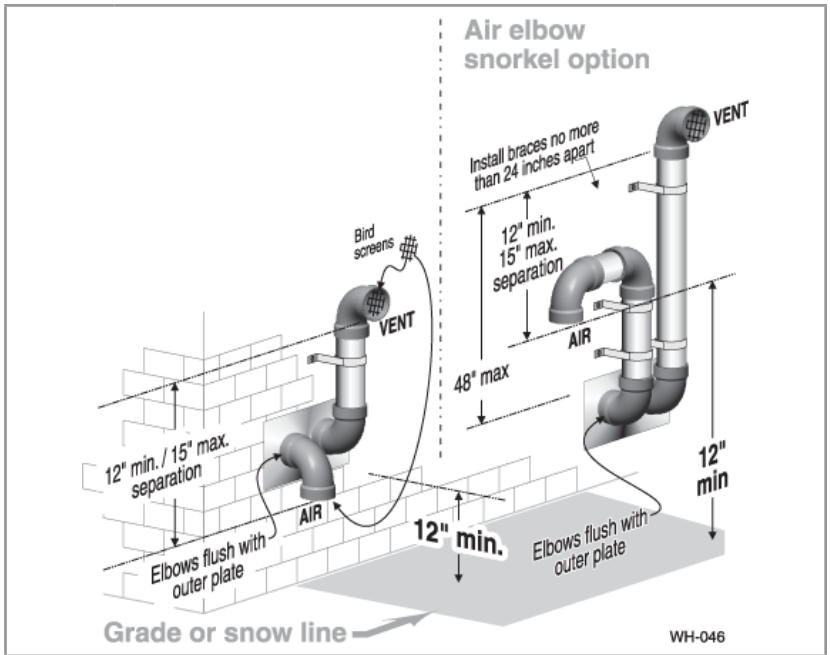
1. The air and vent terminations must be installed as shown in Figure 25, page 27 and Figure 27, page 28.
2. The terminations must comply with clearances and limitations shown in Figure 19, page 23.
3. Locate the terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

⚠WARNING Do not exceed the maximum lengths of the outside vent piping shown in Figure 25. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown. In extremely cold climates, install an insulated chase around the vent piping, particularly if using longer lengths. The chase must allow for inspection of the vent pipe, and insulation must be protected from water.

Multiple vent/air terminations

1. When terminating multiple WM97+ boilers, terminate each vent/air connection as described in this manual.

Figure 25 INSTALLATION SEQUENCE — Separate pipes sidewall



Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 19 through page 24.** Polypropylene AL29-4C S.S. See notices at left.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected sidewall termination location complies with Figure 19, page 23. (Multiple boiler sidewall plates must also comply with Figure 26, page 28.)

Step 4 Use only the vent materials listed in Figure 18, page 21. Provide pipe adapters where required. Vent piping and air piping lengths must not exceed the values shown in Figure 17, page 20.

Step 5 Prepare the sidewall penetrations and secure the sidewall plates as instructed in this section. See "Prepare wall penetrations" on page 28. Polypropylene AL29-4C S.S. See notices at left.

Step 6 The air piping must terminate in a **down-turned elbow** as shown above. The vent piping must terminate in an **elbow pointed outward or away from the air inlet** as shown above. See illustration above.

Step 7 Install vent and air piping between the boiler and the sidewall openings. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 36 for general guidelines. Polypropylene AL29-4C S.S. See notices at left.

Step 8 Install pipe supports every 5 feet on both the horizontal and vertical runs. Install a hanger support within 6 inches of any upturn in the piping, or per vent pipe manufacturer's instructions. Polypropylene AL29-4C S.S. See notices at left.

Step 9 Attach the vent termination exterior piping: Use either of the configurations shown above, as needed to ensure clearance above grade or snow line.

Step 10 The vent and air pipes may run up as high as 4 feet with no enclosure. The vent and air pipes must be secured with braces, and all clearances and lengths must be maintained. Space braces no further than 24 inches apart.

Step 11 External venting greater than 4 feet requires an insulated enclosure around the vent and air pipes. The vent and air terminations must exit through the enclosure as shown in the illustration above, maintaining all required clearances.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

DIRECT VENT — Sidewall with separate pipes *(continued)*

Polypropylene AL29-4C S.S. See notices on previous page.

⚠WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearances shown in Figure 26, page 28 for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a WM97+ boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Prepare wall penetrations

1. Air pipe penetration:
   a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or non-combustible construction, size the vent pipe hole at least 0.4" larger than the vent pipe diameter.
   b. Insert a galvanized metal thimble in the vent pipe hole as shown in Figure 27.
3. Use a sidewall termination plate as a template for correct location of hole centers.
   a. Sidewall termination plates for 3" PVC piping are included with the Weil-McLain sidewall vent/air plate kit, shipped with each boiler.
   b. For 3" AL29-4C vent pipe (with 3" PVC air pipe) or for 2" PVC vent/air piping, purchase optional sidewall separate pipes plate kit.
4. Follow all local codes for isolation of vent pipe when passing through floors or walls.
5. Seal exterior openings thoroughly with exterior caulk.

Termination and fittings

1. Prepare the vent termination elbow and the air termination elbow by inserting bird screens. (See Figure 25, page 27.) Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. When completed, the air termination coupling must be oriented at least 12 inches below the vent termination and at least 12 inches above grade or snow line as shown in Figure 25, page 27.
3. You can orient the vent termination elbow either directly outward or 90 degrees away from the air inlet elbow as shown in Figure 25, page 27.
4. Maintain the required dimensions of the finished termination piping as shown in Figure 25, page 27.
5. For multiple boiler terminations, see Figure 26, page 28.
6. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

NOTICE If extending the vent and air pipes out from the wall, install a coupling on each pipe. Mount the piping with the coupling flush with the outer plate.

Figure 26 Multiple separate pipes sidewall terminations — maintain vertical spacing between vent and air fittings shown in Figure 25, page 27

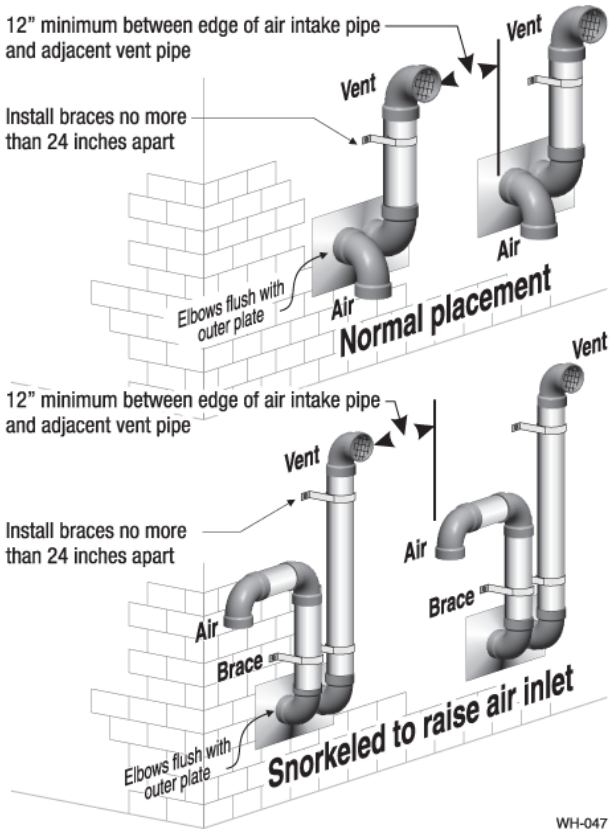
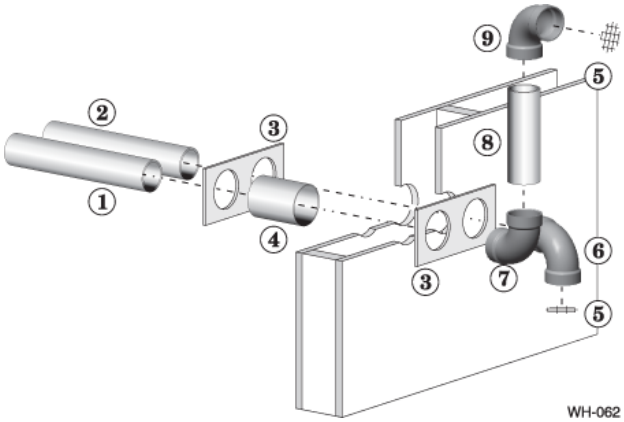


Figure 27 Sidewall termination assembly — using separate pipes



1	Vent piping	4	Galvanized thimbles, by installer
2	Air piping	5	Bird screen, by installer
3	Sidewall termination plates: for 3" PVC, use plates supplied with boiler in W-M vent/air plate kit; for 3" AL29-4C or 2" PVC, purchase optional sidewall separate pipes plate kit	6	Air inlet elbow
		7	Elbow
		8	Nipple
		9	Elbow (vent termination)

DIRECT VENT — Sidewall concentric

Allowable vent/air pipe materials & lengths

1. The concentric termination kit must be purchased separately.

⚠WARNING Use only the vent materials and kits listed in Figure 18, page 21. Provide pipe adapters if specified.

2. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 17, page 20.
3. This termination requires a 45-degree elbow that is not supplied with the termination kit. The maximum vent/air pipe lengths include allowance for this elbow.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler vent and air connections and at the termination if using a 3" PVC concentric vent kit. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition at the boiler vent connection. Air pipe must be PVC or CPVC. Provide a 3" PVC transition at the boiler air connection if using 2" air pipe. Provide transition pieces to PVC at the vent and air pipe termination connections.

Determine termination location

1. The concentric termination kit must be installed as shown in Figure 30, page 30.
2. The termination must comply with clearances and limitations shown in Figure 19, page 23.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

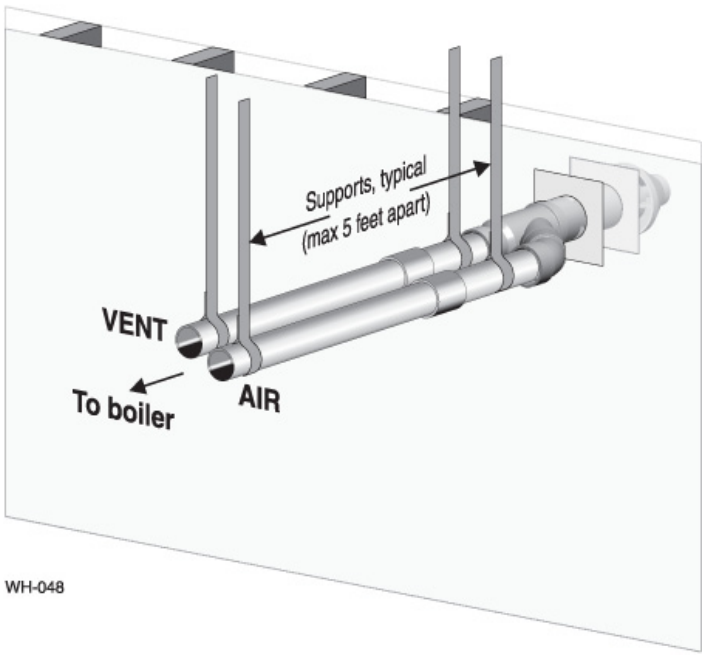
Multiple vent/air terminations

1. When terminating multiple WM97+ boilers, install each concentric termination as described in this manual.

⚠WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearance as shown in Figure 29, page 30 for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a WM97+ boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Figure 28 INSTALLATION SEQUENCE — Concentric horizontal



Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 19 through page 24.** Polypropylene AL29-4C S.S. See notices at left.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected sidewall termination location complies with Figure 19, page 23. (Multiple boiler concentric terminations must also comply with Figure 29, page 30.)

Step 4 Use only the vent materials listed in Figure 18, page 21. Provide pipe adapters where required.

Step 5 Vent piping and air piping lengths must not exceed the values shown in Figure 17, page 20.

Step 6 The concentric termination must be assembled and installed before piping from the boiler to the termination.

Step 7 Prepare the sidewall penetration — assemble the concentric termination kit and secure the cover plates as instructed in this section. Provide the supports indicated and mount the termination assembly. See "Install termination — concentric pipes" on page 30. Polypropylene AL29-4C S.S. See notices at left.

Step 8 Install vent and air piping between the boiler and the concentric vent/air termination. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 36 for general guidelines.

Step 9 Install pipe supports every 5 feet on both the horizontal and vertical runs. Polypropylene AL29-4C S.S. See notices at left.

Step 10 Install a hanger support within 6 inches of any upturn in the piping. Polypropylene AL29-4C S.S. See notices at left.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

DIRECT VENT — Sidewall concentric *(continued)*

Polypropylene AL29-4C S.S. See notices on previous page.

Install termination — concentric pipes

1. Assemble the vent termination as described for concentric terminations, on page 35.

⚠WARNING If necessary, you can shorten the lengths of the inner and outer pipes for a shorter finished assembly. But you must ensure the pipes butt correctly at both ends. Failure to properly assemble the concentric termination can result in flue gas recirculation, causing possible severe personal injury or death.

2. Wall penetration:
   a. Preferably, use a thimble with a 4½-inch hole. If not using a thimble, carefully use a hole saw to cut a hole not larger than 4¾ inches in diameter through the wall. The finished hole must provide a solid stop for the rain cap ribs, as shown in the inset to Figure 30.

⚠WARNING Ensure that the wall material is strong enough to prevent the rain cap from being pushed inward if struck or pushed from the outside.

3. Secure the termination in place so the rain cap will butt against the outside wall or outer thimble plate as shown in Figure 30, page 30.
4. Before beginning vent and air piping from the boiler to the concentric termination, mount and secure the concentric termination as shown in Figure 30, page 30.

⚠WARNING The vent and air piping must be securely supported, and must not rest its weight on the boiler fittings. Failure to properly support the vent and air piping could result in vent piping damage, resulting in possible severe personal injury, death or substantial property damage.

The supports/bracing used must support the termination assembly to prevent slippage or movement. See instructions provided with concentric kit for details.

The clamps used on the outside of the termination pipe must not cut into the pipe or contain sharp edges that could cause a crack to form.

⚠WARNING When inserting the partially-assembled termination kit through the wall penetration, wrap plastic or other protection over the end of the exposed assembly to prevent debris from entering the pipes. If the air passages become blocked, the boiler will not operate. Once the rain cap has been cemented to the assembly, there is no way to correct the problem. The assembly would have to be replaced if it were cut to be removed and cleaned. Altering the assembly in any way could result in severe personal injury or death due to toxic flue product emissions.

⚠WARNING If using AL29-4C stainless vent pipe, use the vent pipe manufacturer's PVC adapter if connecting to a PVC concentric vent attachment.

5. After the assembly has been positioned in the opening and all supports have been attached, install a bird screen (purchased separately if not included with the kit) and rain cap as follows:
   a. Place the bird screen on the end of the inner pipe as in Figure 36, page 35, or per concentric kit instructions for polypropylene kits.
   b. Cement the rain cap in place as shown.

Figure 29 Termination location — concentric termination — multiple boilers — clearance from vent of one to air intake of the next

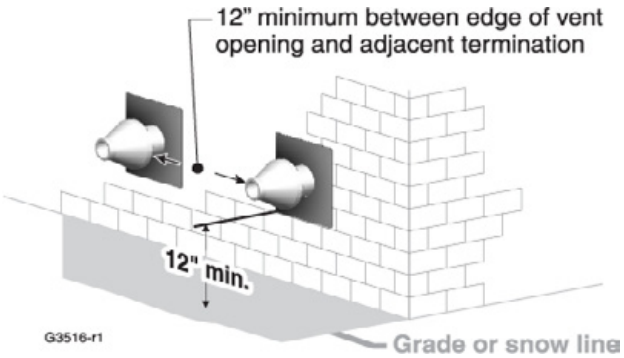
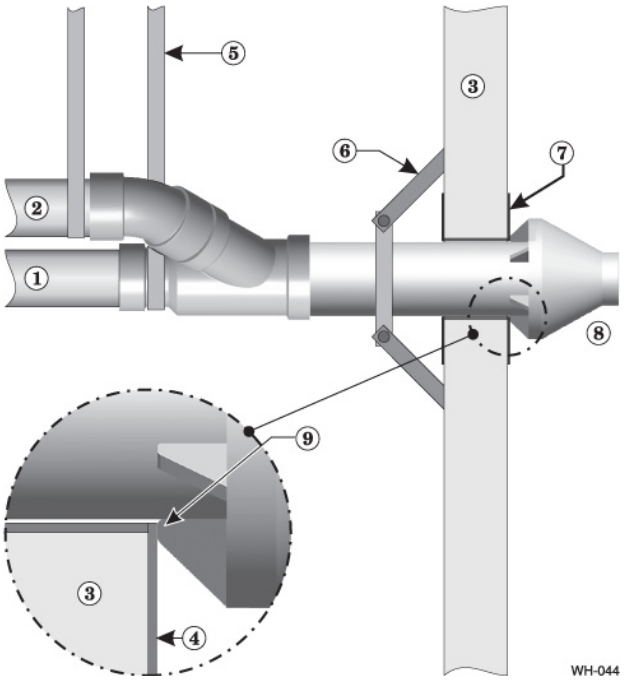


Figure 30 Installing and supporting the concentric sidewall vent assembly



LEGEND

1	Vent pipe	**6**	Wall brace, by installer, (or see vent pipe mfr's instructions)
2	Air pipe	**7**	Thimble, by installer
3	Wall	**8**	Rain cap
4	Outer thimble plate	**9**	Rain cap ribs must butt against outer thimble plate or wall opening
5	Supports every 5 feet or per vent pipe mfr's instructions		

DIRECT VENT — Vertical with separate pipes

Allowable vent/air pipe materials & lengths

⚠WARNING Use only the vent materials and kits listed in Figure 18, page 21. Provide pipe adapters if specified.

1. Locate the terminations such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 17, page 20.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler vent and air connections. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition piece at the boiler vent connection. The air piping must be PVC or CPVC. Provide a 3" PVC transition piece at the boiler air connection if using 2" air piping.

Determine termination location

1. The air and vent terminations must be installed as shown in Figure 31.
2. The terminations must comply with clearances and limitations shown in Figure 19, page 23.
3. Locate the terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

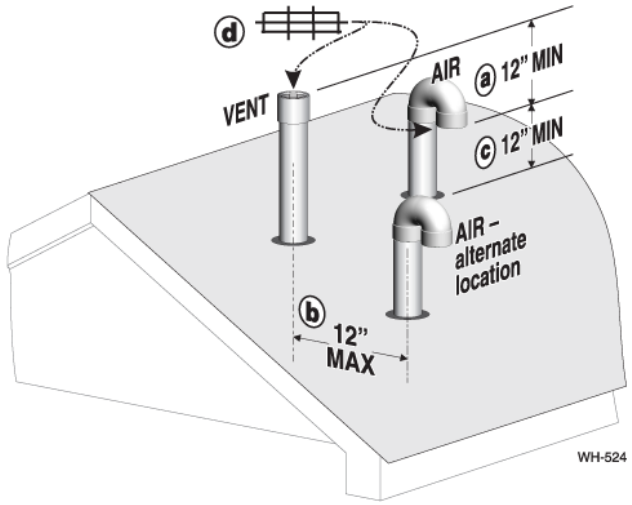
Multiple vent/air terminations (Figure 32)

1. When terminating multiple WM97+ boilers, terminate each vent/air connection as described in this section.

⚠WARNING Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place roof penetrations to obtain minimum clearance of 12 inches between edge of air intake elbow and adjacent vent pipe of another boiler for U. S. installations (see Figure 32, page 32). For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a WM97+ boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Figure 31 Separate pipes vertical termination



Terminate vent and air pipes such that:

- **a AIR INTAKE** IS AT LEAST 12 inches below vent outlet
- **b AIR INTAKE** IS NO FURTHER than 12 inches away center to center
- **c AIR INTAKE** IS AT LEAST 12 inches above roof or snow line
- **d Vent and air terminations are fitted with bird screens**

Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 19 through page 24.** Polypropylene AL29-4C S.S. See notices at left.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected vertical termination location complies with Figure 19, page 23. (Multiple boiler terminations must also comply with Figure 32, page 32.)

Step 4 Use only the vent materials listed in Figure 18, page 21. Provide pipe adapters where required. Vent piping and air piping lengths must not exceed the values shown in Figure 17, page 20.

Step 5 Prepare the vertical penetrations and secure penetration components as instructed in this section. See "Prepare roof penetrations" on page 32 and "Termination and fittings" on page 32.

Step 6 The air piping must terminate in a 180-degree return bend or **downturned elbow** as shown above. The vent piping must terminate in a **coupling pointed upward** as shown above.

Step 7 Install vent and air piping between the boiler and the vertical terminations. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. Install pipe supports every 5 feet on both the horizontal and vertical runs. Install a hanger support within 6 inches of any upturn in the piping. See page 36 for general guidelines. Also comply with vent pipe manufacturer's instructions. Polypropylene AL29-4C S.S. See notices at left.

Step 8 Insert the vent and air piping through the vertical penetrations and secure the termination fittings.

Step 9 Maintain clearances shown above. Vent and air terminations must be fitted with a bird screen as shown.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

DIRECT VENT — Vertical with separate pipes *(continued)*

Polypropylene AL29-4C S.S. See notices on previous page.

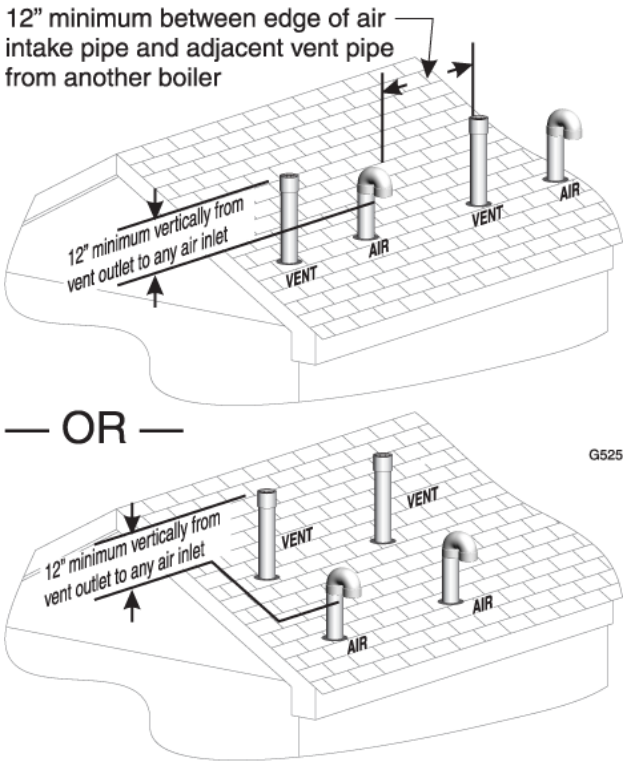
Prepare roof penetrations

1. Air pipe penetration:
   a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or non-combustible construction, size the vent pipe hole at least 0.4" larger than the vent pipe diameter.
   b. Insert a galvanized metal thimble in the vent pipe hole.
3. Space the air and vent holes to provide the minimum spacings shown in Figure 25, page 27.
4. Follow all local codes and vent pipe manufacturer's instructions for isolation of vent pipe when passing through floors, ceilings and roofs.
5. Provide flashing and sealing boots sized for the vent pipe and air pipe. Follow all vent pipe manufacturer's instructions.

Termination and fittings

1. Prepare the vent termination elbow and the air termination elbow (Figure 31, page 31) by inserting bird screens. Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. The air piping must terminate in a down-turned 180-degree return bend as shown in Figure 31, page 31. Locate the air inlet pipe no further than 12 inches from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream.
3. The vent piping must terminate in an up-turned coupling as shown in Figure 31, page 31. The top of the coupling must be at least 1 foot above the air intake. The air inlet pipe and vent pipe can be located in any desired position on the roof, but must always be no further than 12 inches apart and with the vent termination at least 1 foot above the air intake.
4. Maintain the required dimensions of the finished termination piping as shown in Figure 31, page 31.
5. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

Figure 32 Terminations for multiple boilers



⚠WARNING Also maintain maximum distances between the vent and air pipes for each boiler as shown in Figure 25, page 27.

DIRECT VENT — Vertical concentric

Allowable vent/air pipe materials & lengths

1. The concentric termination kit must be purchased separately.

⚠WARNING Use only the vent materials and kits listed in Figure 18, page 21. Provide pipe adapters if specified.

2. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 17, page 20.
3. This termination requires a 45-degree elbow that is not supplied with the termination kit. The maximum vent/air pipe lengths include allowance for this elbow.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transitions at the boiler vent and air connections and at the termination if using a 3" PVC concentric vent kit. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition at the boiler vent connection. Air pipe must be PVC or CPVC. Provide a 3" PVC transition at the boiler air connection if using 2" air pipe. Provide transition pieces to PVC at the vent and air pipe termination connections.

Determine termination location

Locate the concentric vent/air termination using the following guidelines:

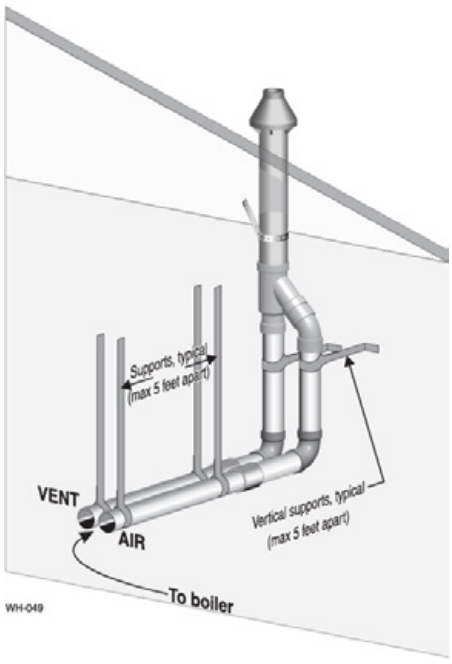
1. The concentric vent/air assembly must terminate as shown in these instructions.
2. The termination must comply with the clearances and limitations shown in Figure 19, page 23.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.
4. For Canadian installations, follow requirements of CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.

Multiple vent/air terminations

1. When terminating multiple WM97+ boilers, install the concentric vent/air termination assemblies as described in this manual.

⚠WARNING All vent outlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

Figure 33 INSTALLATION SEQUENCE — Concentric vertical



Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 19 through page 24.** Polypropylene AL29-4C S.S. See notices at left.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected vertical termination location complies with Figure 19, page 23. (Multiple boiler concentric terminations must also comply with Figure 34, page 34.)

Step 4 Use only the vent materials listed in Figure 18, page 21. Provide pipe adapters where required.

Step 5 Vent piping and air piping lengths must not exceed the values shown in Figure 17, page 20.

Step 6 The concentric termination must be assembled and installed before piping from the boiler to the termination.

Step 7 Prepare the vertical penetration(s) — assemble the concentric termination kit and secure the penetration components as instructed in this section. Provide the supports indicated and mount the termination assembly. See "Prepare roof penetrations" on page 34 and "Mount concentric termination" on page 34. Polypropylene AL29-4C S.S. See notices at left.

Step 8 Install vent and air piping between the boiler and the concentric vent/air termination. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 36 for general guidelines.

Step 9 Install pipe supports every 5 feet on both the horizontal and vertical runs. Polypropylene AL29-4C S.S. See notices at left.

Step 10 Install a hanger support within 6 inches of any upturn in the piping. Polypropylene AL29-4C S.S. See notices at left.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

DIRECT VENT — Vertical concentric *(continued)*

Polypropylene AL29-4C S.S. See notices on previous page.

2. Place roof penetrations to obtain minimum of 12 inches between centers of adjacent vent pipe of another boiler for U. S. installations (see Figure 34, page 34).
3. The air inlet of a WM97+ boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Prepare roof penetrations

1. Roof penetration hole:
   a. Cut a clearance hole to clear the termination outside diameter as prescribed in the kit instructions.
   b. Insert a galvanized metal thimble in the vent pipe hole.
2. Follow all local codes for isolation of vent pipe when passing through floors, ceilings and roofs.
3. Provide flashing and sealing boots sized for the concentric termination outside diameter.

Mount concentric termination

1. Mount the termination as shown in Figure 35.
2. Support the concentric vent/air termination at the roof penetration as shown in Figure 35 or per concentric kit instructions.
   - The supports/bracing used must support the termination assembly to prevent vertical slippage or sideways movement.
   - The clamps used on the outside of the termination pipe must not cut into the pipe or contain sharp edges that could cause a crack to form.

⚠WARNING The vent and air piping must be securely supported, and must not rest its weight on the boiler fittings. DO NOT drill or screw into either the vent pipe or air pipe. Failure to properly support the vent and air piping could result in vent piping damage, resulting in possible severe personal injury, death or substantial property damage.

⚠WARNING When inserting the partially-assembled termination kit through the roof penetration, wrap plastic or other protection over the end of the exposed assembly to prevent debris from entering the pipes. If the air passages become blocked, the boiler will not operate. Once the rain cap has been cemented to the assembly, there is no way to correct the problem. The assembly would have to be replaced if it were cut to be removed and cleaned. Altering the assembly in any way could result in severe personal injury or death due to toxic flue product emissions.

⚠WARNING If using AL29-4C stainless vent pipe, use the vent pipe manufacturer's PVC adapter if connecting to a PVC concentric vent attachment.

⚠WARNING Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe.

3. After the assembly has been positioned in the roof opening and all supports have been attached, install a bird screen (purchased separately if not included with the kit) and rain cap as follows:
   a. Place the bird screen on the end of the inner pipe as in Figure 36, page 35, or per kit instructions for polypropylene kits.
   b. Cement the rain cap in place.

Figure 34 Vertical termination — 3" PVC concentric — single or multiple boilers

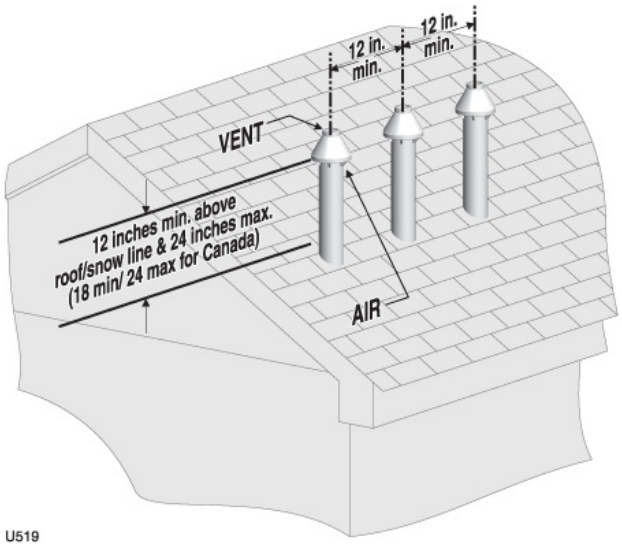
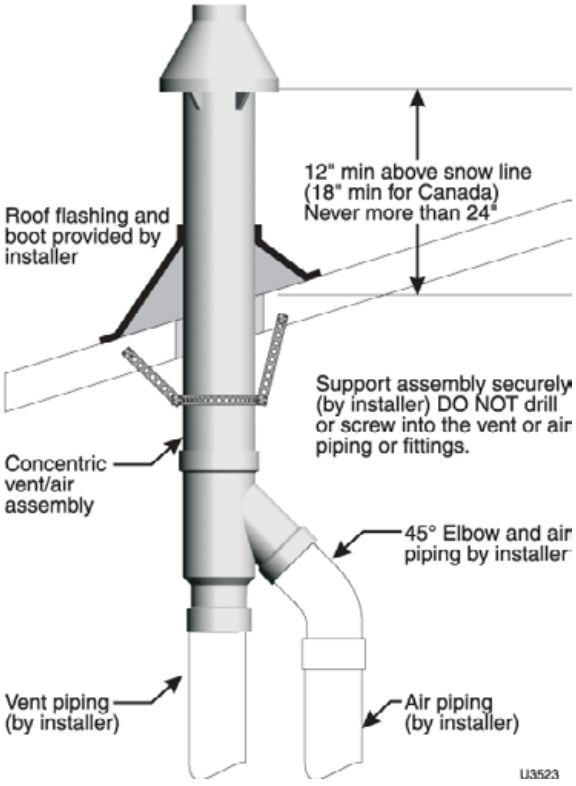
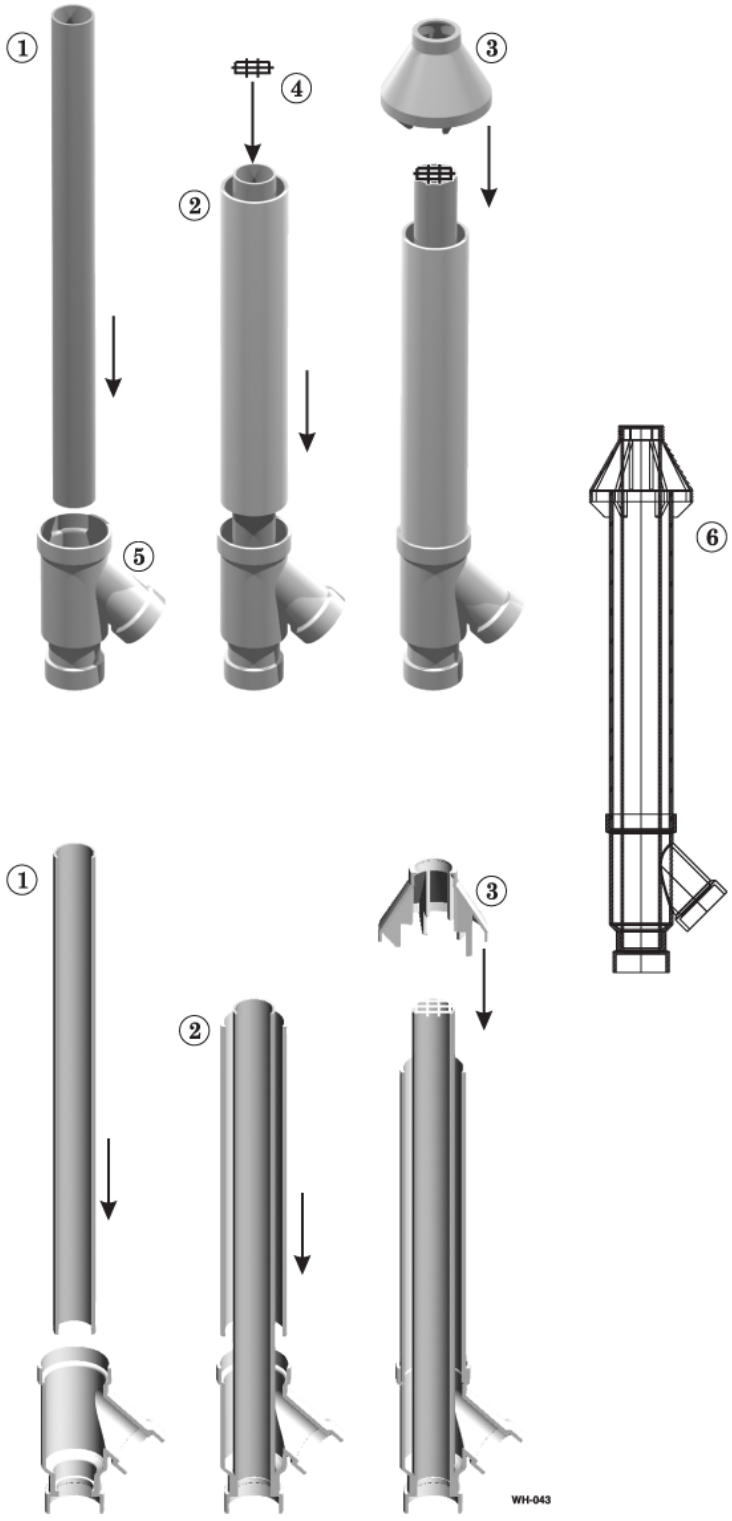


Figure 35 3" PVC concentric termination supports



Concentric termination, typical *(sidewall or vertical)*

Figure 36 **PVC** concentric termination assembly — DO NOT attach the rain cap until the termination has been inserted through the roof or wall and all supports have been installed. See LEGEND at right. See kit instructions for details of polypropylene kits.



LEGEND for Figure 36

1 — Inner PVC pipe (vent)	**4** — Bird screen
2 — Outer PVC pipe (air)	**5** — Y fitting
3 — Rain cap	**6** — Finished assembly

Assembling concentric termination

1. Follow all instructions provided with the concentric termination kit. The following are general guidelines for information only
2. See Figure 36 for the typical assembly of a concentric termination assembly.
3. Prepare the bird screen, item 4 (purchase separately if not included with the kit). Cut the bird screen to size if required. If the bird screen must be trimmed, cut the bird screen to fit the outside diameter of the PVC inner pipe supplied with the termination kit.
4. Partially assemble the vent termination kit in the sequence shown in Figure 36, or per the concentric kit instructions.

⚠WARNING **DO NOT** install the rain cap and bird screen until the assembly has been inserted through the roof (or sidewall) and all supports have been installed. Follow instructions to cover the end of the assembly with plastic before inserting through the roof penetration to prevent debris from blocking the air passages.

⚠WARNING If necessary, you can shorten the lengths of the inner and outer pipes for a shorter finished assembly. But you must ensure the pipes butt correctly at both ends. Failure to properly assemble the concentric termination can result in flue gas recirculation, causing possible severe personal injury or death.

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transitions at the boiler vent and air connections and at the termination if using a PVC concentric vent kit.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition at the boiler vent connection. Air pipe must be PVC or CPVC. Provide a 3" PVC transition at the boiler air connection if using 2" air pipe. Provide transition pieces to PVC at the vent and air pipe termination connections.

Vent and air piping and boiler connections

Follow termination instructions

1. Read and follow all instructions for the termination type used before proceeding with this page. Follow all instructions provided by vent pipe manufacturer.

⚠WARNING Use only materials from the manufacturers listed in Figure 18, page 21.

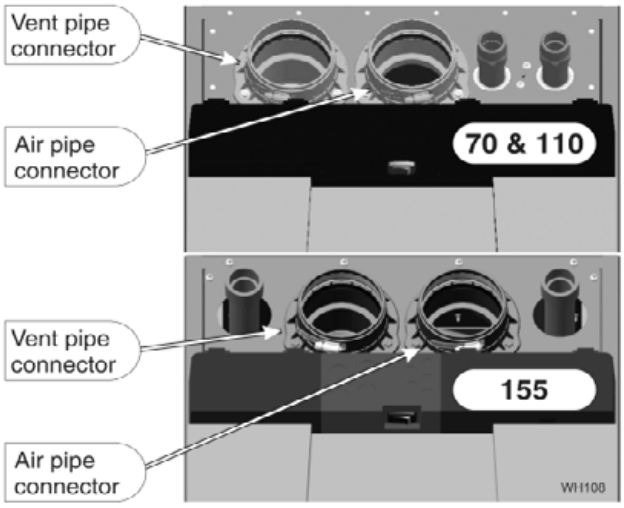
Installing vent and air piping

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide 3" PVC transition pieces at the boiler vent and air connections, and also at the termination if using the W-M termination plate. Provide 2" or 3" PVC transitions at the termination if using a PVC concentric vent kit. Install a locking collar at every joint.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer's instructions. Provide a 3" PVC transition piece at the boiler vent connection. Air piping must be PVC or CPVC. Connect to the boiler air piping only with 3" PVC (use a transition piece for 2" air pipe). Provide 3" PVC connections at the termination if using the W-M termination plate. Provide 2" or 3" PVC transitions at the termination if using a PVC concentric vent kit.

1. Work from the boiler to vent or air termination. Do not exceed the lengths given in the previous pages for either the air or vent piping.
2. See Figure 37 for attaching vent (and air) pipes at the boiler. Connections must be 3" PVC or CPVC only — use transitions if needed to adapt to other material or size (2").
3. Cut pipe to required lengths.
4. Dry assemble entire vent or air piping to ensure proper fit before assembling any joint.
5. Maintain minimum clearance of 3⁄16 inch between vent pipe and any combustible wall or material.
6. Seal wall or floor penetration openings following local code requirements.
7. Assembling PVC or CPVC: (**Polypropylene** **AL29-4C S.S.** — follow pipe manufacturer's instructions for preparation and assembly)
   a. Deburr inside and outside of pipe ends.
   b. Chamfer outside of each pipe end to ensure even cement distribution when joining.
   c. Clean all pipe ends and fittings. Dry thoroughly.
   d. For each joint:
      - Handle fittings and pipes carefully to prevent contamination of surfaces.
      - Apply primer liberally to both joint surfaces — pipe end and fitting socket.
      - While primer is still damp, lightly apply approved cement to both surfaces in a uniform coating.
      - Apply a second coat to both surfaces. Avoid using too much cement on sockets to prevent cement buildup inside.
      - With cement still wet, insert pipe into fitting, twisting ¼ turn. Make sure pipe is fully inserted.
      - Wipe excess cement from joint. Check joint to be sure a smooth bead of cement shows around the entire joint.

Figure 37 Boiler vent and air connections



⚠WARNING **ADAPTERS** — Use adapters if using other than 3-inch PVC or CPVC. This is required for different materials or if using 2-inch pipe.

1. Use ONLY 3" PVC or CPVC pipe at boiler connections.
2. Clean and deburr inside and outside of both ends of air and vent pipes. Chamfer boiler end of vent pipe for ease of insertion.

⚠WARNING The vent pipe end must be smooth and chamfered to prevent possible damage to sealing gasket in vent pipe adapter.

3. Inspect vent or air adapter (above) — verify no obstructions or foreign objects inside.
4. Loosen clamp screw.
5. Measure 3½ inches from end of pipe and make a mark with felt-tip pen.
6. Loosen adapter clamp screw.
7. Apply small amount of silicon grease to end of pipe to ease insertion.
8. Insert pipe into adapter.
9. Slide pipe down until the 3½-inch mark is reached.

⚠WARNING Do not apply excessive force or bend the adapter or flue/air pipe when inserting. The adapter or seal could be damaged. If any portion of the vent or air system is damaged, it must be replaced.

10. Secure vent or air pipe by tightening the adapter clamp securely. Do not overtighten.
11. The seal is accomplished with the internal gasket. The clamp is only to hold the pipe in place.

⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.

Install water piping

⚠WARNING Use two wrenches when tightening water piping at boiler, using one of the wrenches to prevent the boiler interior piping from turning. Failure to support the boiler piping connections to prevent them from turning could cause damage to boiler components.

General piping information

Additional controls, if required

NOTICE The WM97+ control uses temperature sensors to provide both high limit protection and modulating temperature control. **The control's high limit function requires manual reset**. Some codes/jurisdictions may require additional external controls for high limit and/or low water cutoff protection.

Additional limit controls

Following standard industry practices, if installation is to comply with ASME or Canadian requirements, an additional high temperature limit may be needed. Consult local requirements for other codes/standards to determine if needed.

1. Install a manual reset high temperature limit constructed to prevent a temperature setting above 200°F in system supply piping between boiler and isolation valve. (Note that the WM97+ control operating limit function shuts the boiler down at 195°F, or lower if set to a lower value.)

⚠WARNING **Multi-temperature systems** — If the heating system includes circuits that require lower temperature water (radiant slab circuits, for example) as well as higher temperature circuits, it is recommended to protect low-temperature circuits with limit controls that are wired to a WM97+ control external limit circuit terminals.

2. See instructions beginning on page 64 for wiring information.

3. If using a manual reset limit control or wiring in the manual reset circuit, set WM97+ control boiler limit at least 20°F less than the external manual reset limit (i.e., set WM97+ control no higher than 180°F for a 200°F external limit, for example).

Backflow preventer

1. Use backflow preventer in the cold water supply piping if required by local codes.

Internal expansion tank (WM97+70 or 110 only, not on WM97+155)

1. The WM97+70 and 110 boilers are equipped with an internal expansion tank, factory charged to 12 PSIG.

2. The internal expansion tank is suitable for most systems with total volume of 15 gallons or less. See page 42 for suggestions for adding additional a supplementary expansion tank for higher-volume systems.

3. The maximum operating pressure of the internal expansion tank is 42.5 PSIG.

⚠WARNING The internal expansion tank isolation valve must be turned off during hydrostatic testing.

The internal expansion tank valve **MUST BE OPEN DURING ALL TIMES OF OPERATION.**

System water piping methods

NOTICE Except as shown on page 44, all piping methods shown in this manual use primary/secondary connection to the boiler loop.

These designs ensure proper flow through the WM97+ boiler to provide the most efficient and reliable operation of the boiler and the heating system.

System/zone pipe sizing

(Baseboard, convectors or cast iron radiators ONLY)

1. For residential space heating applications (other than radiant heating or unit heaters) ONLY, you can use the sizing suggestions in Figure 38.

Figure 38 Suggested pipe sizing for system headers and zone piping — RESIDENTIAL with baseboard, convectors or cast iron radiators ONLY (20°F temperature rise)

WM97+ Model	System header
70	1" or larger
110 or 155	1¼" or larger
Recommendations are based on a 20°F temp drop through the system.	

Suggested maximum load per zone	
Copper pipe and baseboard size	Maximum recommended feet of baseboard
¾"	106
1"	179
Size zone circulators to handle the required flow and head loss for each zone.	

Install water piping *(continued)*

Head loss through boiler internal piping

Top boiler connections *(internal by-pass valve OPEN)*

1. See Figure 39 for the head loss through boiler internal piping for boiler top connections. This data is based on primary/secondary piping (boiler internal by-pass valve OPEN).
2. For the special case of direct connection of WM97+70 or 110 boilers, see the information on page 44.

Figure 39 Head loss through boiler internal piping for top boiler connections

WM97+70 or 110		WM97+155	
Flow rate (GPM)	Head loss (Feet W. C.)	Flow rate (GPM)	Head loss (Feet W. C.)
4	0.0	8	2.2
6	1.2	10	2.7
8	1.4	12	3.3
10	1.5	14	4.0
12	1.7	16	4.8
14	2.3	18	5.9

Bottom boiler connections

1. See Figure 40 for the head loss through boiler internal piping for boiler bottom connections.

Figure 40 Head loss through boiler internal piping for bottom connections

WM97+70 or 110		WM97+155	
Flow rate (GPM)	Head loss (Feet W. C.)	Flow rate (GPM)	Head loss (Feet W. C.)
4	0.0	8	1.3
6	0.3	10	2.1
8	0.6	12	3.0
10	1.2	14	4.2
12	2.3	16	5.5
14	2.9	18	7.1

Boiler circulator

1. The boiler circulator is factory-installed in the boiler as shown in this manual. The boiler circulator is selected to ensure adequate flow through the WM97+ boiler.

⚠WARNING **DO NOT** relocate or use the boiler circulator in any way other than shown in this manual.

Failure to comply could result in unreliable performance and nuisance shutdowns from insufficient flow.

System circulators and zone circulators

1. Install a system circulator or zone circulators as shown in the piping diagrams in this manual. These circulators must be supplied by the installer.

System or zone circulator flow rate

1. Size circulators based on the flow rate required to achieve the temperature change needed.
2. You can closely estimate temperature rise (or drop) through a circuit by using the following formula, where TD is temperature rise (or drop), FLOW is flow rate (in gpm), and BTUH is the heat load for the circuit:

$$\text{FLOW} = \frac{\text{BTUH}}{\text{TD x 500}}$$

Examples:

1. Consider a system loop for a system with total heating load equal to 210,000 Btuh. The desired temperature drop through the system piping is 20°F. Then the required flow rate is:

$$\text{FLOW} = \frac{\text{210,000}}{\text{20 x 500}} = \text{21 gpm}$$

SIMPLIFIED:

For 20° temperature drop, FLOW = MBH / 10.

System or zone circulator head requirement

1. The circulator must be capable of delivering the required flow against the head loss that will occur in the piping.
2. Determine the pipe size needed and the resultant head loss using accepted engineering methods.
3. The simplified pipe sizing here is limited to residential systems, and does not include systems with fan coil units or radiant tubing.

⚠CAUTION The following simplified method for pipe and circulator sizing must be limited to residential applications using baseboard (finned or cast iron), cast iron radiators or convectors. DO NOT apply for radiant heating, fan coil units or commercial installations.

Install water piping *(continued)*

Simplified pipe/circulator selection

1. Install the boiler and piping using the recommended piping layouts shown in this manual.
2. Size the piping and components for each circuit in the space heating system using Figure 41. **At the flow rates listed, the head loss in all piping will be 0.04 feet per foot of pipe.**
   a. Determine the heating load (Btuh) for each circuit.
   b. Calculate the flow rate for each circuit using its load.
   c. To use a 20°F temperature drop, just divide the MBH (1,000's of Btuh) by 10.
   d. Example — Flow for 20°F temp drop with 35,000 Btuh:
      FLOW = 35 MBH / 10 = 3.5 gpm
   e. Find the pipe size in Figure 41 that has a max flow rate just larger than that required for the circuit.
   f. Find the total equivalent length (TEL) of the circuit.
   g. TEL accounts for losses through fittings and valves by using the equivalent length of pipe that would cause the same head loss. Add these numbers to the measured length of the circuit to find TEL in feet.
   h. **TEL is usually close to 1.5 times the length of the circuit for residential baseboard, radiator or convector applications.**
   i. Measure the length of each circuit from the circulator outlet back to its inlet. Then multiply this length times 1.5 to get the approximate TEL of the circuit.
   j. Find the head loss for each circuit:

      TEL = 1.5 X Circuit Length *(feet)*

      HEAD = TEL X 0.04 *(feet water column)*

   k. NOTE: Size system header piping for the total flow of all connected zones.
3. Example:
   a. For a circuit with heating load = 45,000 Btuh (= 45 MBH). Measured length of circuit is 88 feet.
   b. Flow = 45 MBH / 10 = 4.5 gpm.
   c. TEL = 1.5 x 88 feet = 132 feet.
   d. From Figure 41, select 1" pipe (max flow = 7.1 gpm).
   e. Head loss = TEL x 0.04 = 132 x 0.04 = 5.28 feet.
   f. Select a circulator that can deliver at least 4.5 gpm at a head of 5.28 feet. (Read the NOTICE below.)

NOTICE To use this method, limit the flow through ¾" finned-tube baseboard to 3.9 gpm, or use 1" baseboard and limit flow to 7.1 gpm. If the total load of the circuit requires more flow, split the circuit into two or more.

Figure 41 Flow rates for ***0.04 feet head loss per foot*** of pipe (140°F water)

Pipe size (inches)	MAX Flow rate (GPM) @ 0.04 feet per foot	Pipe size (inches)	MAX Flow rate (GPM) @ 0.04 feet per foot
¾	3.9	2	45
1	7.1	2½	75
1¼	16	3	140
1½	24	4	290

Install relief valve

1. Install relief valve in ¾" street elbow piped from boiler supply piping tee (Figure 6, page 13).
2. Pipe the relief valve only as shown, in the location shown.
3. Connect discharge piping to safe disposal location, following guidelines in the **WARNING** below.

⚠WARNING **To avoid water damage or scalding due to relief valve operation, as per local or state codes**:

Install relief valve ONLY with the spindle vertical, as shown in illustrations in this manual.

Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge. Locate away from the top of the boiler.

Discharge line must be as short as possible and be the same size as the valve discharge connection throughout its entire length.

Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.

The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375 °F or greater.

Do not pipe the discharge to any place where freezing could occur.

No shutoff valve shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.

Test the operation of the valve after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

Internal water piping — WM97+70 and 110

Set primary/secondary by-pass valve WM97+70 or 110 only

1. The primary/secondary by-pass valve (item 5 in the illustrations at right) allows selecting whether the boiler is direct-connected or primary/secondary connected to the system.
   a. Close the valve for direct connection (Figure 42). Use this option ONLY if the system piping is connected per the instructions in this manual.
   b. Open the valve for primary/secondary connection (Figure 43).

⚠WARNING **The boiler relief valve MUST be piped only to the boiler supply connection. DO NOT pipe to the return connection.** Install relief valve in ¾" street elbow piped from boiler supply piping tee (Figure 6, page 13). Pipe the relief valve only as shown, in the location shown in Figure 6, page 13. Failure to comply could prevent the relief valve from properly protecting the boiler, resulting in possible severe personal injury, death or substantial property damage.

⚠WARNING DO NOT operate the boiler with the valve closed on a system that is zoned with circulators or if the system has a separate system circulator. This could cause the boiler circulator to operate in series with external circulators, causing possible excess pressure on valves and system components.

Operate with the by-pass closed (using boiler circulator for system flow) **ONLY** where shown on application instructions in this manual.

DO NOT remove or relocate the boiler circulator.

DO NOT attempt to change the boiler internal piping.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

Figure 42 **WM97+70/110** internal piping with by-pass valve **CLOSED** (boiler circulator provides system flow) — some componensts omitted for clarity — see legend below left

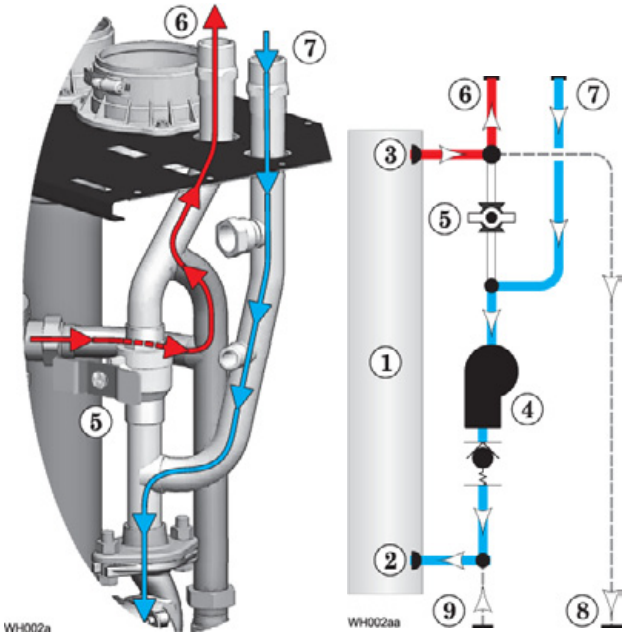
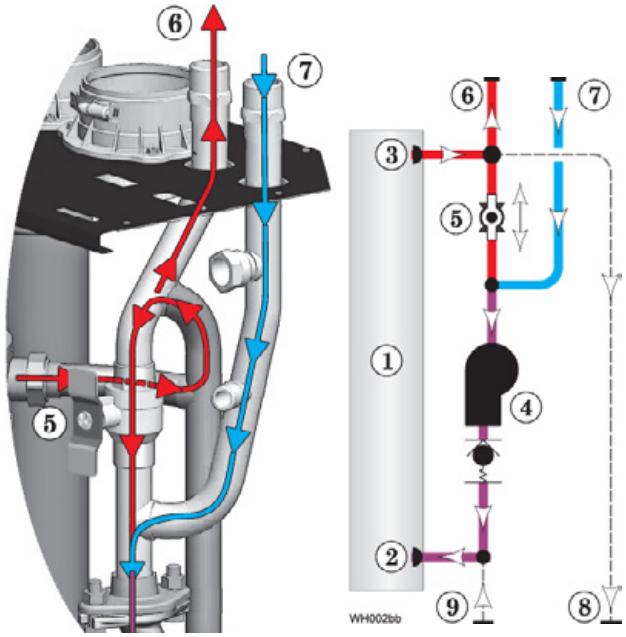
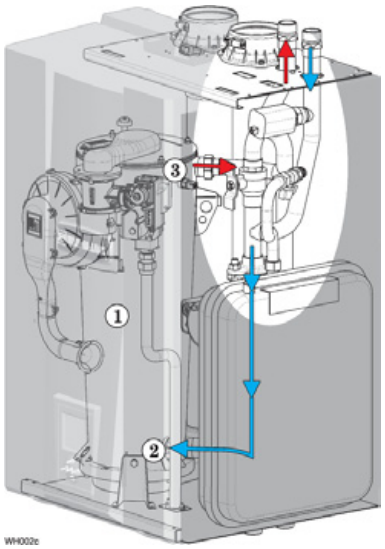


Figure 43 **WM97+70/110** internal piping with by-pass valve **OPEN** (primary/secondary connection — separate system pump (or zone pumps) must be supplied — some componensts omitted for clarity — see legend below left



Legend for Figure 42 and Figure 43



1 Heat exchanger
2 Return entrance to heat exchanger
3 Supply exit from heat exchanger
4 Boiler circulator — DO NOT REMOVE OR RELOCATE!
5 Primary/secondary by-pass valve — OPEN for primary/secondary piping; CLOSED for direct connection
6 Supply connection to heating system (P/T gauge and relief valve must be mounted to supply as shown in Figure 6, page 13)
7 Return connection from heating system
8 Boiler water supply connection to DHW storage tank, if used — requires separate external circulator to provide flow for the DHW tank
9 Boiler water return connection from DHW storage tank, if used

Internal water piping — WM97+155

Set primary/secondary by-pass valve WM97+155 only

⚠WARNING **The internal primary/secondary valve MUST be OPEN for all applications except for installations with multiple WM97+ boilers, piped as shown in this manual.**

⚠WARNING Single-boiler installations require a separate system circulator (or zone circulators). DO NOT attempt to use the boiler internal circulator for system circulation.

⚠WARNING **The boiler relief valve MUST be piped only to the boiler supply connection. DO NOT pipe to the return connection.** Install relief valve in ¾" street elbow piped from boiler supply piping tee (Figure 6, page 13). Pipe the relief valve only as shown, in the location shown in Figure 6, page 13. Failure to comply could prevent the relief valve from properly protecting the boiler, resulting in possible severe personal injury, death or substantial property damage.

DO NOT remove or relocate the boiler circulator.

DO NOT attempt to change the boiler internal piping.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

1. The primary/secondary by-pass valve (item 5 in the illustrations at right) is always left OPEN unless the boiler is connected to a multiple-boiler manifold (and the internal circulator provides flow only in the interconnecting piping between the boiler and the manifold).
   a. Single-boiler installation — Open the valve for primary/secondary connection (Figure 44).
   b. Multiple-boiler installation — Close the valve for direct connection to the multiple-boiler manifold (Figure 45).

Legend for Figure 44 and Figure 45	
1 Heat exchanger	6 Supply connection to heating system (P/T gauge and relief valve must be mounted to supply as shown in Figure 6, page 13)
2 Return entrance to heat exchanger	7 Return connection from heating system
3 Supply exit from heat exchanger	8 Boiler water supply connection to DHW storage tank, when used — requires separate external circulator to provide flow for the DHW tank
4 Boiler circulator — DO NOT REMOVE OR RELOCATE!	9 Boiler water return connection from DHW storage tank, when used
5 Primary/secondary by-pass valve — OPEN for primary/secondary piping; CLOSED for direct connection (MBS only)	

Figure 44 **WM97+155** internal piping with by-pass valve **OPEN** — (primary/secondary connection — separate system pump (or zone pumps) must be supplied — some components omitted for clarity — see legend above right

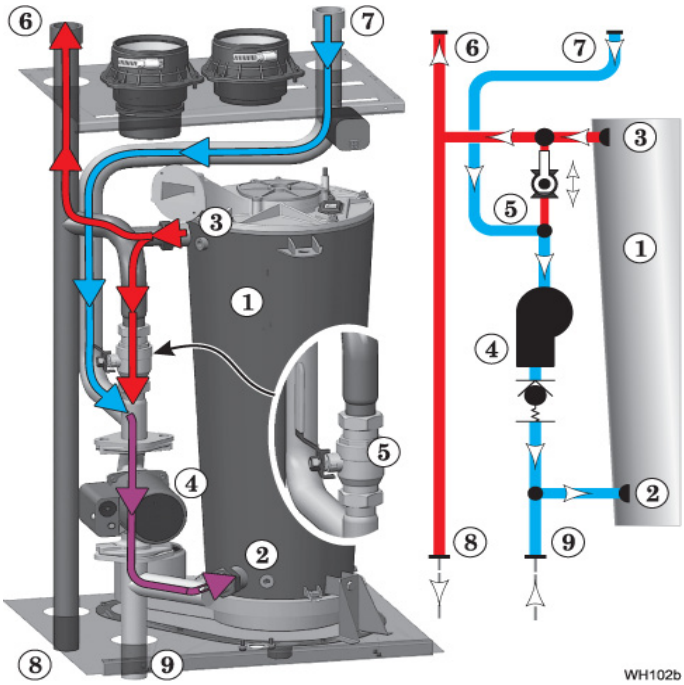
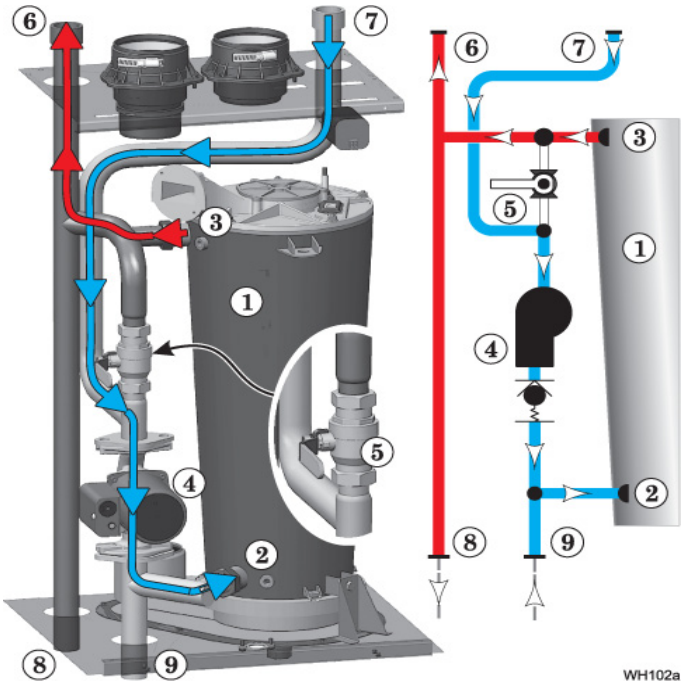


Figure 45 **WM97+155** internal piping with by-pass valve **CLOSED — Multiple-boiler applications ONLY** (boiler circulator provides flow to and from primary/secondary manifolds) — some components omitted for clarity — see legend above right



Expansion tank — WM97+70 and 110

Supplementary expansion tank, if required
— systems having volumes more than 15 gallons only

1. The boiler is equipped with an internal diaphragm-type expansion tank, factory charged to 12 PSIG.
   a. The internal tank is suitable for systems up to 15 gallons, not including the volume of water in the boiler and its internal piping.
   b. This should be adequate for finned-tube baseboard systems and most radiant heating systems.
   c. Existing expansion tanks should be left in place even if additional expansion tank capacity is not needed for the system.

⚠CAUTION **For larger volume systems, such as systems with radiators or cast iron baseboard, provide an additional expansion tank sufficient for the system volume**. Undersized expansion tanks cause system water to be lost from relief valve and make-up water to be added through fill valve. Eventual boiler failure can result due to excessive make-up water addition.

2. If the system does not have an existing expansion tank, add a diaphragm or bladder-type tank, piped as in Figure 46. Always install an automatic air vent on top of the air separator to remove residual air from the system.

NOTICE If using diaphragm or bladder tanks only — if the boiler is installed above the system main piping, install an automatic air vent in the top of the outgoing boiler piping to prevent air pocketing.

⚠CAUTION Follow the expansion tank manufacturer's sizing and application guidelines

Existing expansion tanks

1. An existing expansion tank should be piped as in Figure 46 for diaphragm or bladder-type tanks, or Figure 47 for a closed-type expansion tank.

⚠CAUTION DO NOT install automatic air vents on closed-type expansion tank systems. Air must remain in the system and return to the tank to provide its air cushion. An automatic air vent would cause air to leave system, resulting in water-logging the expansion tank. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent

NOTICE If possible, replace an existing closed-tanks with a diaphragm or bladder-type expansion tank. Closed-type tanks often cause air removal problems.

LEGEND for Figure 46 and Figure 47

1 WM97+ boiler	15 Supplementary expansion tank, closed-type, if used
3 Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information	20 Make-up water supply
4 Relief valve piping to drain — see page 39	23 Backflow preventer, if used
6 Isolation valves	25 Pressure reducing valve, if used
8 Supplementary expansion tank, diaphragm type, if used	26 Internal expansion tank, diaphragm-type
9 Air separator	27 Quick-fill valve, if used
10 Flow/check valve (in boiler circulator)	28 DHW boiler water supply connection, when used — see page 13 for information
11 Purge/drain valves	29 DHW boiler water return connection, when used — see page 13 for information
12 Boiler circulator	30 Pressure/temperature gauge, supplied with boiler, field piped
14 Primary/secondary by-pass valve — see page 40 for information	

Figure 46 **WM97+70/110** external expansion tank piping, diaphragm or bladder-type

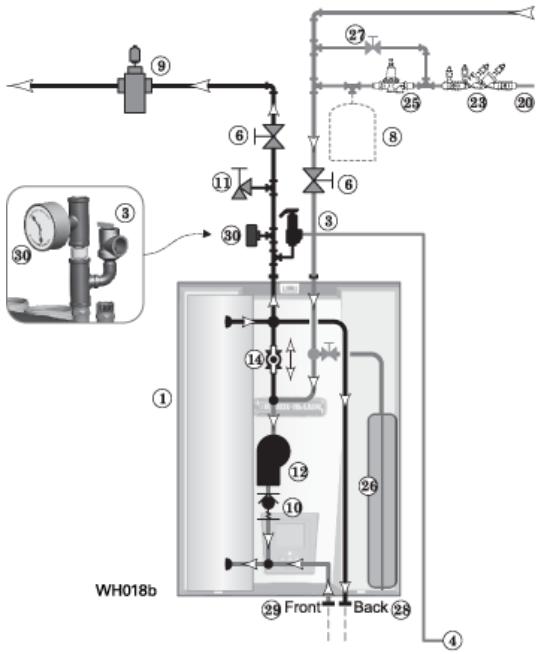
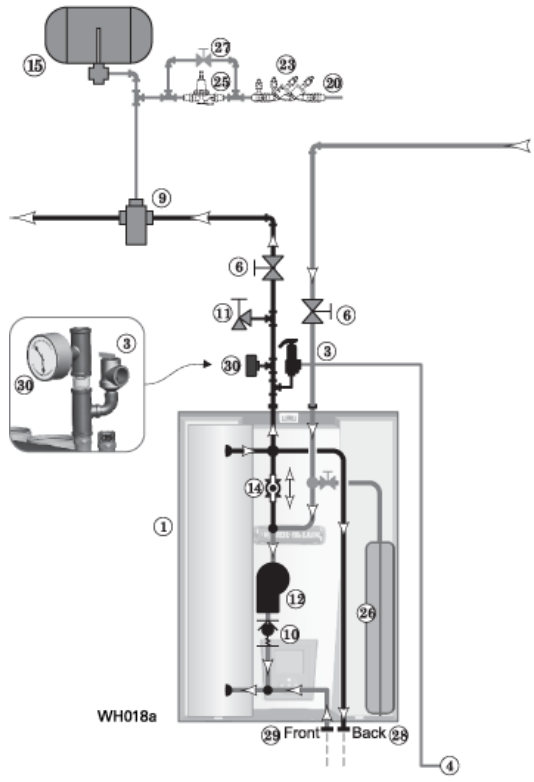


Figure 47 **WM97+70/110** external expansion tank piping, closed-type expansion tank



Expansion tank — WM97+155

Expansion tank

Figure 48 and Figure 49 show typical installations of the system expansion tank. Always locate the air separator and expansion tank as shown in the suggested piping drawings, beginning on page 47.

Ensure that the expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions and ratings for details. Additional tanks may be added to the system if needed to handle the expansion. These tanks may be installed by connecting to tees in the system piping.

⚠CAUTION **Undersized expansion tanks** cause system water to be lost from the relief valve and makeup water to be added through the fill valve. Eventual boiler failure can result due to excessive make-up water addition. Always locate the **cold water fill connection** at the expansion tank. Never locate this elsewhere in the system.

Diaphragm- or bladder-type tank:

Refer to Figure 48 for suggested piping when using a diaphragm- or bladder-type expansion tank.

NOTICE **Diaphragm- or bladder-type expansion tank** — Control **fill pressure** with the tank air charge pressure. Always check pressure and charge tank ***with tank removed from system*** to be sure reading is accurate. Boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.

Install an **automatic air vent** on top of the air separator, per separator manufacturer's instructions.

Closed-type expansion tank:

⚠CAUTION DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

Figure 49 shows suggested piping when using a closed-type expansion tank, in which the air is directly in contact with tank water.

Connect piping (½" or ¾") from the air separator top outlet to the tank fitting. Slope any horizontal piping a minimum of 1 inch per 5 feet of horizontal pipe.

Always use a **tank fitting**, such as the B&G *Tanktrol* or Taco *Taco-Trol* (shown). The fitting reduces gravity flow of water in the piping to the tank, avoids air bubbling through the tank water, and provides the proper fill height in the tank.

⚠CAUTION **Correct all leaks** in the system or tank piping. Leaks allow air to escape from the system and will cause water-logging of the tank. This will result in water loss through the boiler relief valve due to over-pressurization. **NEVER** use an automatic air vent in a system equipped with a closed-type expansion tank. The air removed from the system will cause water-logging of the expansion tank.

NOTICE **Closed-type expansion tank** — Follow tank manufacturer's instructions for **filling the tank**. Typical tank sizing provides for approximately 12 PSIG when the tank is filled to the normal level and system water is cold. Note that boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.

LEGEND for Figure 48 and Figure 49

1 WM97+ boiler	15 System expansion tank, closed-type, when used
3 Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information	20 Make-up water supply
4 Relief valve piping to drain — see page 39	23 Backflow preventer, when used
6 Isolation valves	25 Pressure reducing valve, when used
8 System expansion tank, diaphragm type, when used	27 Quick-fill valve, when used
9 Air separator	28 DHW boiler water supply connection, when used — see page 13 for information
10 Flow/check valve (in boiler circulator)	29 DHW boiler water return connection, when used — see page 13 for information
11 Purge/drain valves	30 Pressure/temperature gauge, supplied with boiler, field piped
12 Boiler circulator	31 System circulator, supplied by installer
14 Primary/secondary by-pass valve — see page 41 for information	

Figure 48 **WM97+155** external expansion tank piping, diaphragm or bladder-type

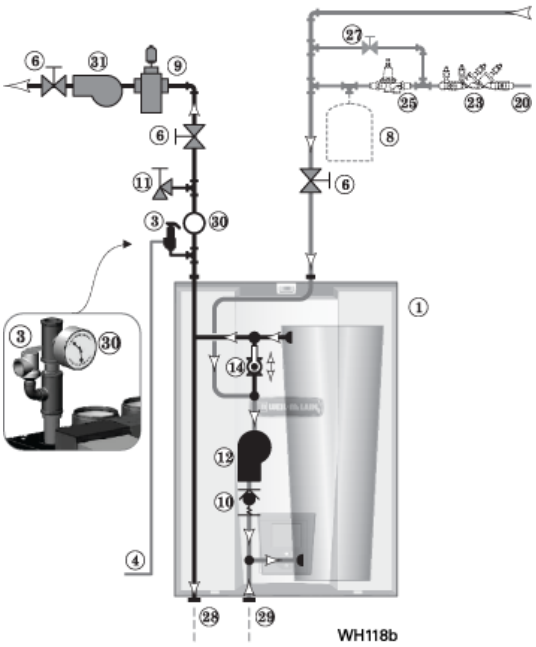
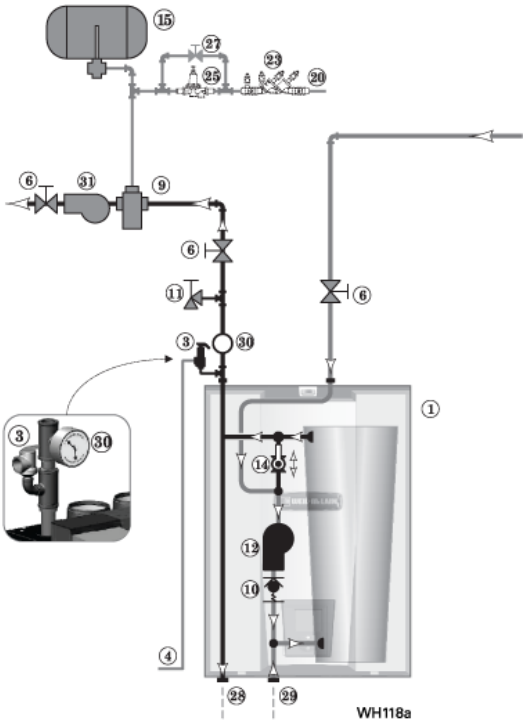


Figure 49 **WM97+155** external expansion tank piping, closed-type expansion tank



System piping

ZONE VALVE zoning — direct connection
Internal P/S by-pass valve CLOSED
WM97+70 or 110 only

The WM97+70 or 110 boiler internal circulator can be used to circulate many heating systems using the arrangement shown in Figure 50 and in Figure 51, page 45.

Verify the application will work:

To determine if direct connection will provide enough flow for the system, use Figure 52, page 45. Pay careful attention to the following .

- **MAIN LINE SIZING** — Use at least the size shown for mains.
- **BRANCH LINES** — Branch lines must be at least ¾ inch, as shown.
- **TOTAL FLOW** — This is the total flow to the system at a 20°F temperature drop.
- **CIRCULATOR HEAD AVAILABLE** — This is the head available to overcome head loss through the piping. (This equals circulator capacity minus boiler internal flow losses.)

INFORMATION APPLICABLE ONLY TO BASEBOARD SYSTEMS:

- **MINIMUM NUMBER OF CIRCUITS** — The system must be split into no less than this number of circuits — to limit the flow to either the maximum for ¾" piping or the maximum the circulator can handle with its available head.
- **MAXIMUM FLOW PER CIRCUIT** — This is the highest flow acceptable for any one circuit. If a circuit requires higher flow, split the circuit into multiple circuits that all have flow within the limit. If this cannot be done, the circuit must be piped as primary/secondary per Figure 53, page 46.
- **MAXIMUM LOAD OF ANY CIRCUIT** — This is determined from the maximum flow for any circuit (BTUH = GPM x 500 x 20°F).
- **MAXIMUM FEET BASEBOARD** — This is determined from the maximum load, assuming baseboard output of 600 Btuh per foot).
- **MAXIMUM CIRCUIT LENGTH** — This is the maximum total length of any circuit, measured along the piping, beginning at the boiler, along the main line, through the heating branch and back to the boiler. DO NOT use direct connection if any heating loop exceeds this value.

NOTICE **For systems other than finned tube or cast iron baseboard —** Use the CIRCULATOR HEAD AVAILABLE to determine whether the boiler circulator can provide the flow needed. (See Figure 52, page 45.)

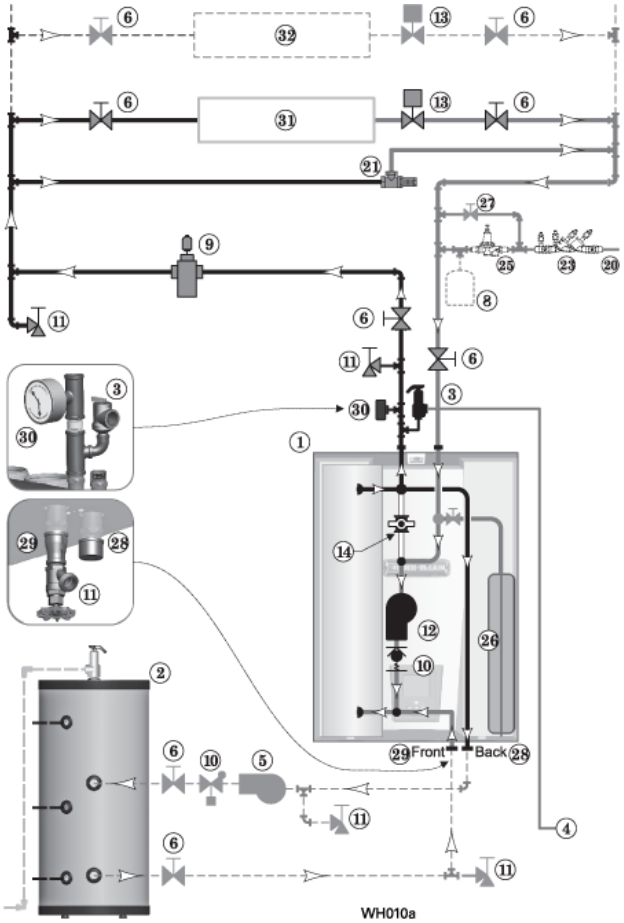
NOTICE **For systems requiring higher flow or head loss —** apply the suggested piping of Figure 53, page 46, NOT that of Figure 50.

NOTICE **Balancing, if required** — Substitute a memory-stop valve for one of the isolation valves in each zone to use the memory-stop valve for balancing flow as well as isolation.

NOTICE **DHW tank as a zone** — A DHW tank can be connected in the system as a zone if NOT direct-connecting the boiler to a DHW tank or CWH. If domestic priority is required, use a Weil-WMZV zone controller to operate zones and activate the boiler.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 50 **WM97+70/110** Zone valve zoning — direct connection (boiler circulator provides flow for system — boiler primary/secondary by-pass valve CLOSED) (See next page for legend)



NOTICE **CWH unit installations** — refer to the Weil-McLain CWH manual for piping and installation requirements.

⚠CAUTION Wire all zone valve end switches to the boiler's ZONE 2 input. Provide isolation relays if using 3-wire zone valves.

⚠CAUTION **By-pass pressure regulator** — All zone valve systems shown in this manual RECOMMEND the installation of a by-pass pressure regulator (unless other provision is made). This is common practice for zone valve systems, but is mandatory for the WM97+ applications. This is because the WM97+ control can be set to continue running the circulator after the call for heat has ended (called post-pump). The by-pass pressure regulator prevents dead-heading the circulator if all zone valves are closed.

System piping *(continued)*

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 51 **WM97+70/110** Zone valve zoning — direct connection (boiler primary/secondary by-pass valve CLOSED)

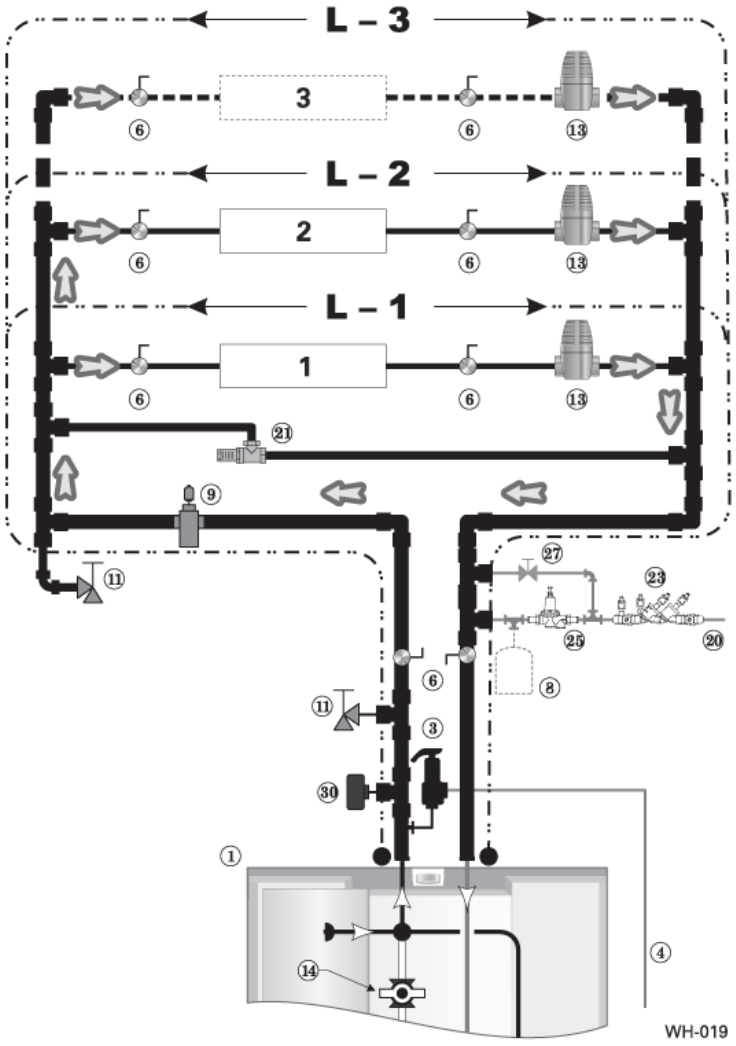


Figure 52 The system must meet the following requirements when applying Figure 51

Boiler model	WM97+70	WM97+110
MAIN line size (inches) [▬▬]	1	1
BRANCH line size (inches) [▬▬]	¾	¾
Total FLOW, GPM	6.3	9.9
Boiler internal circulator: TACO model	007-IFC	0015-MSF2-IFC
Circulator HEAD (feet) available to the system	5.0	6.5
Finned-tube baseboard (¾") applications:		
Minimum NUMBER of circuits	2	3
Maximum FLOW per circuit, GPM (20°F temperature drop)	3.5	4.0
Maximum LOAD per circuit, MBH	35	40
Maximum FEET of FINNED TUBE BASEBOARD per loop (@ 600 BTUH per foot)	58	67
L — Maximum circuit length, feet (see L–1, L–2 and L–3 in Figure 51)	102	105

Legend — Figure 50, page 44 & Figure 51, page 45

1 ■ WM97+70 or 110 boiler

2 Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)

3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information

4 Relief valve piping to drain — see page 39

5 DHW circulator

6 Isolation valves

8 Supplementary expansion tank, diaphragm type, if used

9 Air separator

10 Flow/check valve

11 Purge/drain valves (one drain valve is supplied loose with the boiler)

12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler

13 Zone valves

14 ■ Primary/secondary by-pass valve — see page 40 for information — CLOSED: Boiler circulator provides system flow

20 Make-up water supply

21 By-pass pressure regulator, RECOMMENDED for zone valve systems unless other provision is made

23 Backflow preventer, if used

25 Pressure reducing valve, if used

26 ■ Internal expansion tank, diaphragm-type

27 Quick-fill valve, if used

28 ■ DHW boiler water supply connection, when used — see page 13 for information

29 ■ DHW boiler water return connection, when used — see page 13 for information

30 ■ Pressure/temperature gauge, supplied with boiler, field piped

31 Heating circuits

32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

ZONE VALVE zoning — primary/secondary
Internal P/S by-pass valve OPEN
WM97+70 or 110 only

CAUTION The boiler primary/secondary by-pass valve **MUST be OPEN** to prevent excessive head caused by running the boiler circulator and system circulator in series.

See Figure 53.

1. This configuration is for WM97+70 or 110 zone valve systems that need more flow than the boiler's circulator can provide (see page 45 for information).
2. **OPEN** the boiler internal primary/secondary by-pass valve.
3. Install a system circulator (supplied by installer) as shown.
4. A benefit of primary/secondary piping is that it does not apply the head of the boiler circulator to the system zone valves.

Supplementary expansion tank, if used

1. Connect the supplementary expansion tank and make-up water piping as shown in Figure 47, page 42.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used

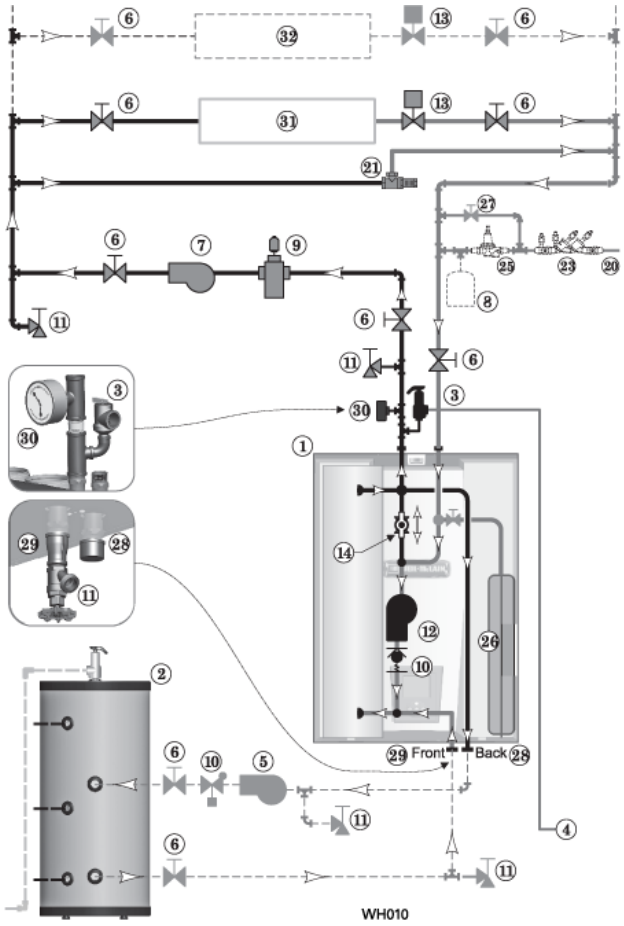
1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See CWH manual for CWH piping instructions.
2. DHW as a zone — A DHW tank can be piped as a zone if a DHW tank or CWH is **NOT** connected to the boiler. To provide DHW priority operation in this case, a Weil-McLain WMZV must be used.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 53.

Controlling the zones

1. The WM97+ control can be set up to operate on space heating only or on space heating plus DHW or CWH. Refer to Field wiring, beginning on page 64, for instructions on wiring to zone valves.
2. The boiler and zone valves can also be operated by a Weil-McLain WMZV zone controller.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 53 **WM97+70/110** Zone valve zoning — primary/secondary connection — a system circulator is required



NOTICE Connect zone valve end switches to ZONE 2 input. Connect system circulator to CIRC 2 output.

CAUTION Use isolation relays if connected 3-wire zone valve end switches to the WM97+ control inputs.

Legend — Figure 53

1 ■ WM97+70 or 110 boiler
2 Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
7 System circulator
8 Supplementary expansion tank, diaphragm type, if used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
13 Zone valves
14 ■ Primary/secondary by-pass valve — see page 40 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
21 By-pass pressure regulator, RECOMMENDED for zone valve systems unless other provision is made
23 Backflow preventer, if used
25 Pressure reducing valve, if used
26 ■ Internal expansion tank, diaphragm-type
27 Quick-fill valve, if used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

ZONE VALVE zoning — primary/secondary
Internal P/S by-pass valve OPEN
WM97+155 only

CAUTION The boiler primary/secondary by-pass valve **MUST be OPEN** for single-boiler WM97+155 applications, with system connected as primary/secondary.

See Figure 54.

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. Install a system circulator (supplied by installer) as shown.
3. A benefit of primary/secondary piping is that it does not apply the head of the boiler circulator to the system zone valves.

Expansion tank required

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used

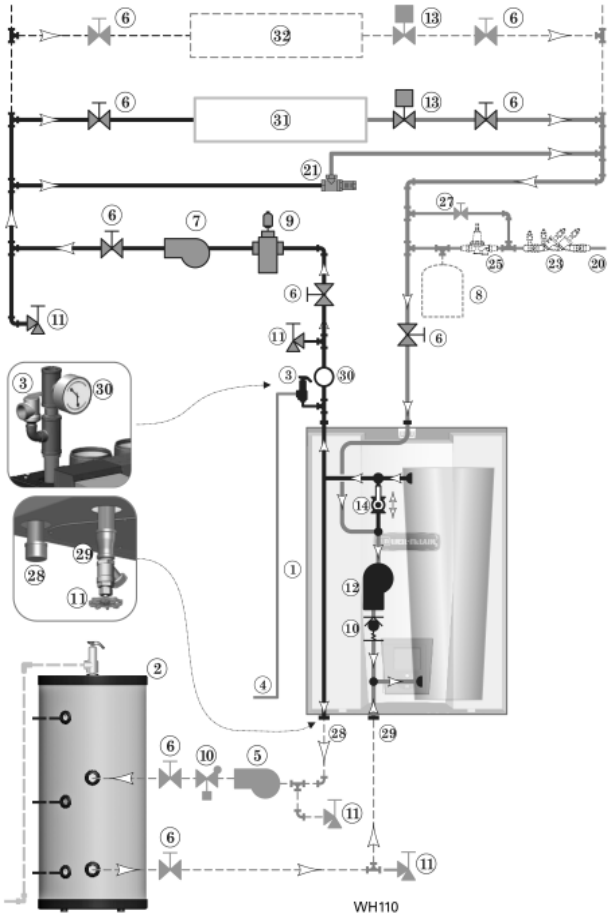
1. DHW or CWH direct connection — Pipe from boiler's bottom connections to water heater boiler connections as shown. See CWH manual for CWH piping instructions.
2. DHW as a zone — A DHW tank can be connected as a zone if a DHW tank or CWH is **NOT** connected to the boiler. To provide DHW priority operation in this case, a Weil-McLain WMZV must be used.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 54.

Controlling the zones

1. The WM97+ control can be set up to operate on space heating only or on space heating plus DHW or CWH. Refer to Field wiring, beginning on page 64, for instructions on wiring to zone valves.
2. The boiler and zone valves can also be operated by a Weil-McLain WMZV zone controller.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 54 **WM97+155** Zone valve zoning — primary/secondary connection — a system circulator is required



NOTICE Connect zone valve end switches to ZONE 2 input. Connect system circulator to CIRC 2 output.

CAUTION Use isolation relays if connected 3-wire zone valve end switches to the WM97+ control inputs.

Legend — Figure 54

1 ■ WM97+155 boiler
2 Indirect water heater, when used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
7 System circulator
8 System expansion tank, diaphragm type, when used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
13 Zone valves
14 ■ Primary/secondary by-pass valve — see page 41 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
21 By-pass pressure regulator, RECOMMENDED for zone valve systems unless other provision is made
23 Backflow preventer, when used
25 Pressure reducing valve, when used
27 Quick-fill valve, when used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

CIRCULATOR zoning — primary/secondary
Internal P/S by-pass valve OPEN
WM97+70 or 110 only

⚠ CAUTION The boiler primary/secondary by-pass valve MUST be open to prevent excessive head caused by running the boiler circulator and zone circulators in series.

See Figure 55.

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.

Supplementary expansion tank, if used

1. If using a supplementary closed-type expansion tank, connect the expansion tank and make-up water piping as shown in Figure 47, page 42.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used —

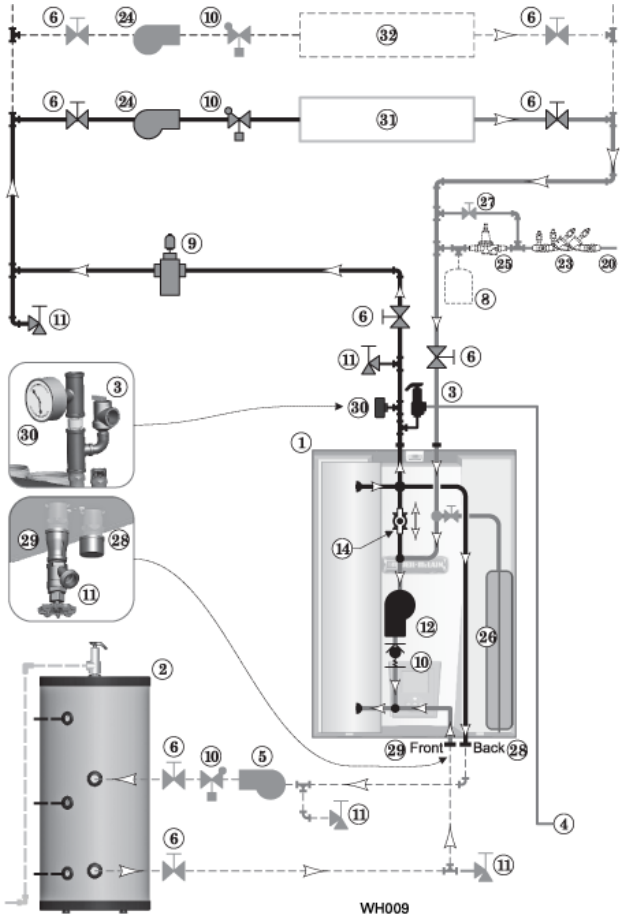
1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 59, page 52) if a DHW tank or CWH is **NOT** connected to the boiler. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 55.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW or CWH plus two space heating, or three space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 55 **WM97+70/110** Circulator zoning plus optional DHW piping



Legend — Figure 55

1 ■ WM97+70 or 110 boiler
2 Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
8 Supplementary expansion tank, diaphragm type, if used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
14 ■ Primary/secondary by-pass valve — see page 40 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
23 Backflow preventer, if used
24 Zone circulators
25 Pressure reducing valve, if used
26 ■ Internal expansion tank, diaphragm-type
27 Quick-fill valve, if used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

CIRCULATOR zoning — primary/secondary
Internal P/S by-pass valve OPEN
WM97+155 only

CAUTION The boiler primary/secondary by-pass valve MUST be open to prevent excessive head caused by running the boiler circulator and zone circulators in series.

See Figure 56.

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.

Expansion tank

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used

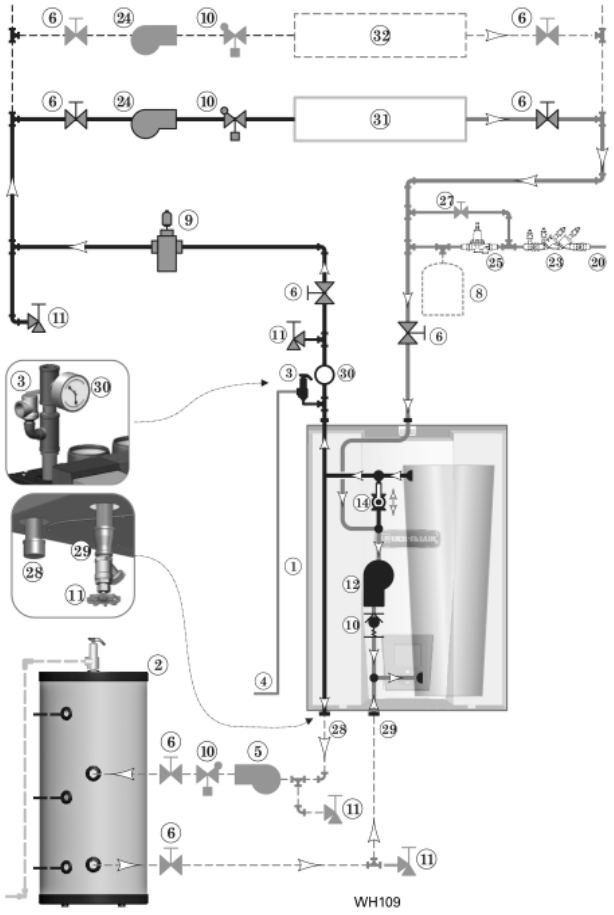
1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 60, page 53) if a DHW tank or CWH is **NOT** connected to the boiler. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 56.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW or CWH plus two space heating, or three space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 56 **WM97+155** Circulator zoning plus optional DHW piping



Legend — Figure 56

1 ■ WM97+155 boiler
2 Indirect water heater, when used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
8 System expansion tank, diaphragm type, when used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
14 ■ Primary/secondary by-pass valve — see page 41 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
23 Backflow preventer, when used
24 Zone circulators
25 Pressure reducing valve, when used
27 Quick-fill valve, when used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

RADIANT HEATING — CIRCULATOR zoning
Internal P/S by-pass valve OPEN
WM97+70 or 110 only

See Figure 57.

1. The WM97+ boiler is ideal for use in radiant heating. The unique heat exchanger design allows it to work well even in condensing mode. There is no need to regulate boiler return water temperature in radiant heating applications.
2. Apply this configuration for typical radiant heating applications.
3. Size the system piping and circulators to provide the flow and pressure drop needed.

High limit in system piping

1. Add the recommended high limit control (Figure 57, item 22) to help ensure supply water temperature will not exceed the maximum allowable for the radiant system.
2. Wire the limit control to either the manual reset or automatic reset external limit circuit of the WM97+ control.

Supplementary expansion tank, if used

1. If using a supplementary closed-type expansion tank, connect the expansion tank and make-up water piping as shown in Figure 47, page 42.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

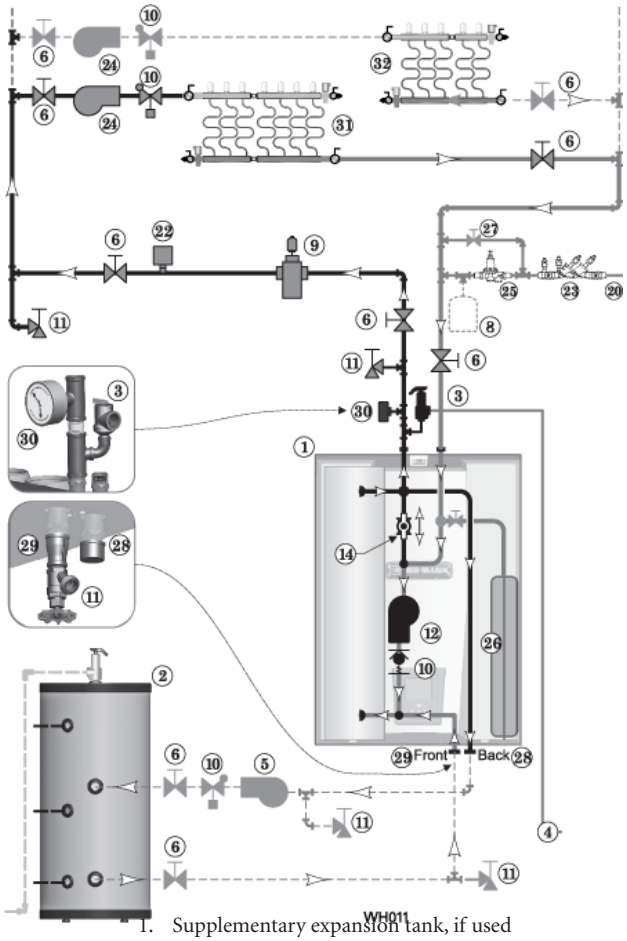
DHW or CWH, if used

1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 59, page 52) if a DHW tank or CWH is **NOT** connected to the boiler. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 57.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW or CWH plus two space heating, or three space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

Figure 57 **WM97+70/110** Typical radiant heating system piping — circulator zoning



1. Supplementary expansion tank, if used

Legend — Figure 57

1	■ WM97+70 or 110 boiler	**8**	Supplementary expansion tank, diaphragm type, if used	**20**	Make-up water supply	**29**	■ DHW boiler water return connection, when used — see page 13 for information
2	Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)	**9**	Air separator	**22**	High limit temperature control	**30**	■ Pressure/temperature gauge, supplied with boiler, field piped
3	■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information	**10**	Flow/check valves	**23**	Backflow preventer, if used	**31**	Heating circuits
4	Relief valve piping to drain — see page 39	**11**	Purge/drain valves (one drain valve is supplied loose with the boiler)	**24**	Zone circulators	**32**	Additional heating circuits, if any
5	DHW circulator	**12**	■ Boiler circulator, with integral flow/check valve, factory installed in boiler	**25**	Pressure reducing valve, if used		
6	Isolation valves	**14**	■ Primary/secondary by-pass valve — see page 40 for information — OPEN: Boiler connected as primary/secondary	**26**	■ Internal expansion tank, diaphragm-type		
				27	Quick-fill valve, if used		
				28	■ DHW boiler water supply connection, when used — see page 13 for information		

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

RADIANT HEATING — CIRCULATOR zoning
Internal P/S by-pass valve OPEN
WM97+155 only

See Figure 58.

1. The WM97+ boiler is ideal for use in radiant heating. The unique heat exchanger design allows it to work well even in condensing mode. There is no need to regulate boiler return water temperature in radiant heating applications.
2. Apply this configuration for typical radiant heating applications.
3. Size the system piping and circulators to provide the flow and pressure drop needed.

High limit in system piping

1. Add the recommended high limit control (Figure 58, item 22) to help ensure supply water temperature will not exceed the maximum allowable for the radiant system.
2. Wire the limit control to either the manual reset or automatic reset external limit circuit of the WM97+ control.

Expansion tank

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

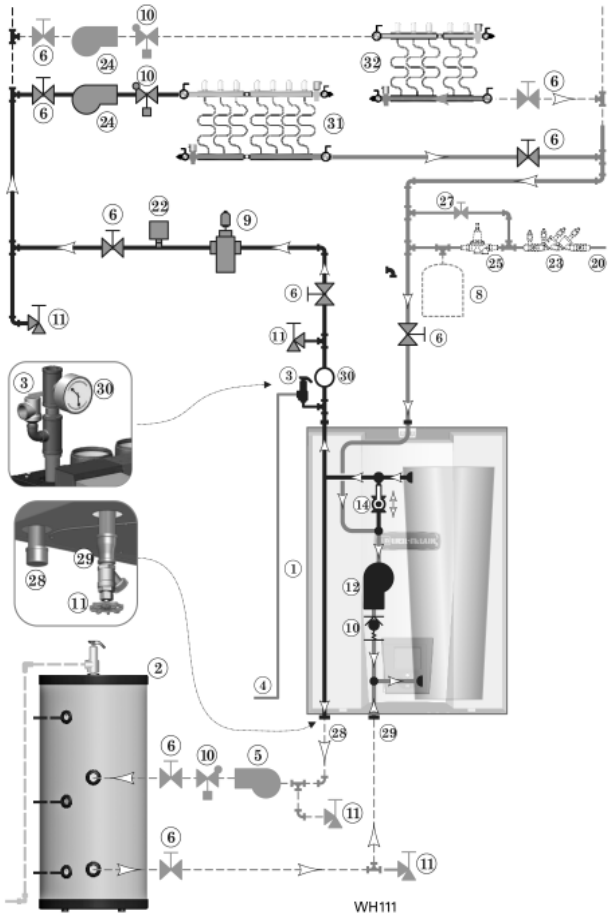
DHW or CWH, if used

1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 60, page 53) if a DHW tank or CWH is **NOT** connected to the boiler. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 58.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW or CWH plus two space heating, or three space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

Figure 58 **WM97+155** Typical radiant heating system piping — circulator zoning



Legend — Figure 58

1 ■ WM97+155 boiler

2 Indirect water heater, when used (for CWH installations, refer to the Weil-McLain CWH manual)

3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information

4 Relief valve piping to drain — see page 39

5 DHW circulator

6 Isolation valves

8 System expansion tank, diaphragm type, when used

9 Air separator

10 Flow/check valves

11 Purge/drain valves (one drain valve is supplied loose with the boiler)

12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler

14 ■ Primary/secondary by-pass valve — see page 41 for information — OPEN: Boiler connected as primary/secondary

20 Make-up water supply

22 High limit temperature control

23 Backflow preventer, when used

24 Zone circulators

25 Pressure reducing valve, when used

27 Quick-fill valve, when used

28 ■ DHW boiler water supply connection, when used — see page 13 for information

29 ■ DHW boiler water return connection, when used — see page 13 for information

30 ■ Pressure/temperature gauge, supplied with boiler, field piped

31 Heating circuits

32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

DHW as a zone — CIRCULATOR zoning
Internal P/S by-pass valve OPEN
WM97+70 or 110 only

⚠CAUTION DO NOT use this piping if the boiler is connected to a CWH unit. The CWH unit requires priority and would prevent priority operation of the system DHW unit.

⚠CAUTION The boiler internal primary/secondary by-pass valve MUST be open to prevent excessive head caused by running the boiler circulator and zone circulators in series.

See Figure 59.

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.
3. Install the DHW tank as a system zone. The DHW tank can be piped as a zone ONLY if a DHW tank or CWH is **NOT** connected to the boiler.
4. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
5. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
6. Terminate the bottom connections as shown in the inset on Figure 59.

Supplementary expansion tank, if used

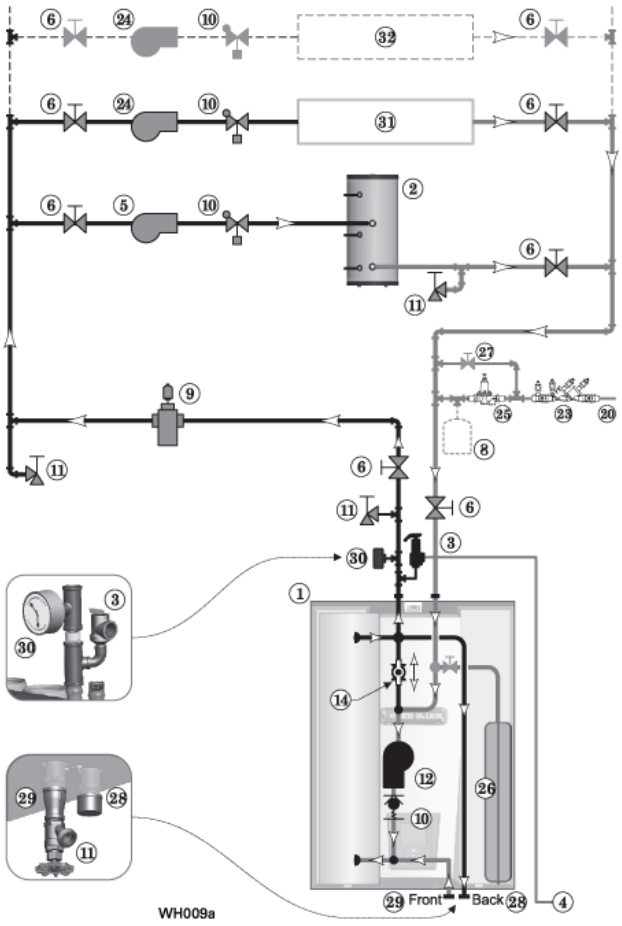
1. If using a supplementary closed-type expansion tank, connect the expansion tank and make-up water piping as shown in Figure 47, page 42.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW plus two space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 59 **WM97+70/110** Circulator zoning with DHW as a zone



Legend — Figure 59

1 ■ WM97+70 or 110 boiler
2 Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
8 Supplementary expansion tank, diaphragm type, if used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
14 ■ Primary/secondary by-pass valve — see page 40 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
23 Backflow preventer, if used
24 Zone circulators
25 Pressure reducing valve, if used
26 ■ Internal expansion tank, diaphragm-type
27 Quick-fill valve, if used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

DHW as a zone — CIRCULATOR zoning
Internal P/S by-pass valve OPEN
WM97+155 only

⚠ CAUTION DO NOT use this piping if the boiler is connected to a CWH unit. The CWH unit requires priority and would prevent priority operation of the system DHW unit.

⚠ CAUTION The boiler internal primary/secondary by-pass valve MUST be open to prevent excessive head caused by running the boiler circulator and zone circulators in series.

See Figure 60.

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.
3. Install the DHW tank as a system zone. The DHW tank can be piped as a zone ONLY if a DHW tank or CWH is **NOT** connected to the boiler.
4. Wire the DHW circulator to boiler Zone 1. Set the boiler circulator to ON in the DHW Settings menu.
5. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
6. Terminate the bottom connections as shown in the inset on Figure 60

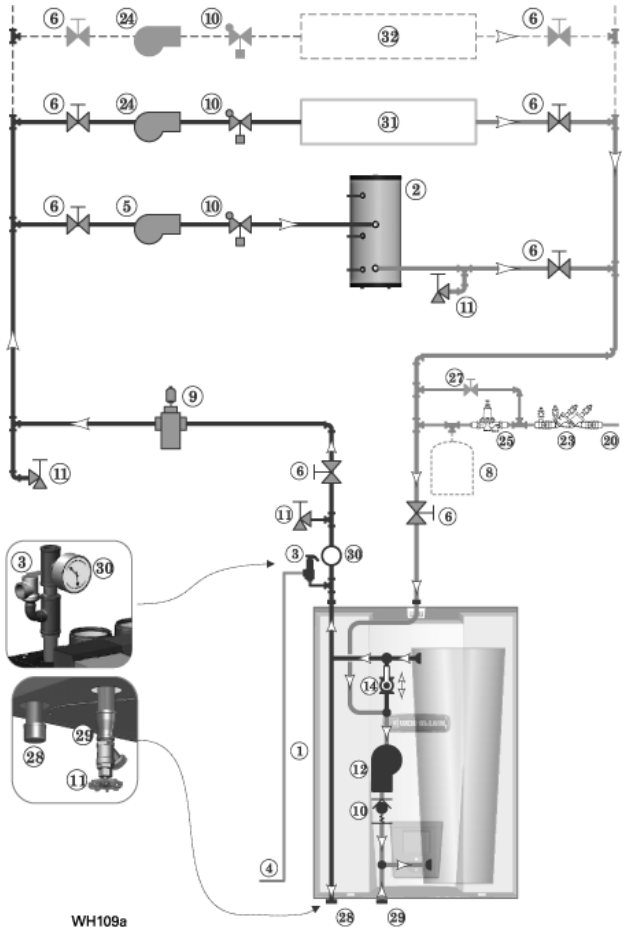
Expansion tank

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

Controlling the zones

1. The WM97+ control operates up to three zones (DHW plus two space heating). Refer to Field wiring, beginning on page 64, for instructions on wiring to circulators.
2. For more than three zones, use a Weil-McLain WMCR zone controller. See suggested wiring in this manual.

Figure 60 **WM97+155** Circulator zoning with DHW as a zone



Legend — Figure 60

1 ■ WM97+155 boiler

2 Indirect water heater, when used (for CWH installations, refer to the Weil-McLain CWH manual)

3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information

4 Relief valve piping to drain — see page 39

5 DHW circulator

6 Isolation valves

8 System expansion tank, diaphragm type, when used

9 Air separator

10 Flow/check valves

11 Purge/drain valves (one drain valve is supplied loose with the boiler)

12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler

14 ■ Primary/secondary by-pass valve — see page 41 for information — OPEN: Boiler connected as primary/secondary

20 Make-up water supply

23 Backflow preventer, when used

24 Zone circulators

25 Pressure reducing valve, when used

27 Quick-fill valve, when used

28 ■ DHW boiler water supply connection, when used — see page 13 for information

29 ■ DHW boiler water return connection, when used — see page 13 for information

30 ■ Pressure/temperature gauge, supplied with boiler, field piped

31 Heating circuits

32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

System piping *(continued)*

WATER CHILLER systems — ZONE VALVES
Internal P/S by-pass valve OPEN
WM97+70 or 110 only

See Figure 61

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. The chiller must be piped in parallel with the boiler.
3. Use appropriate valves to prevent chilled medium from entering boiler.
4. Circulator zoning option — The space heating system can be zoned with circulators if a separate circulator is supplied for the chilled water loop. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.

NOTICE If antifreeze is used in the system, consider the effects of antifreeze on circulator sizing and DHW performance. Some local codes may require double-wall DHW heat exchanger design. Use only the antifreeze listed by Weil-McLain for use with this boiler. See page 88 for details.

⚠WARNING Chilled medium, if used, is piped in parallel with heating boiler as shown in Figure 61. Use appropriate valves to prevent chilled medium from entering boiler. If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle.

Expansion tank

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used —

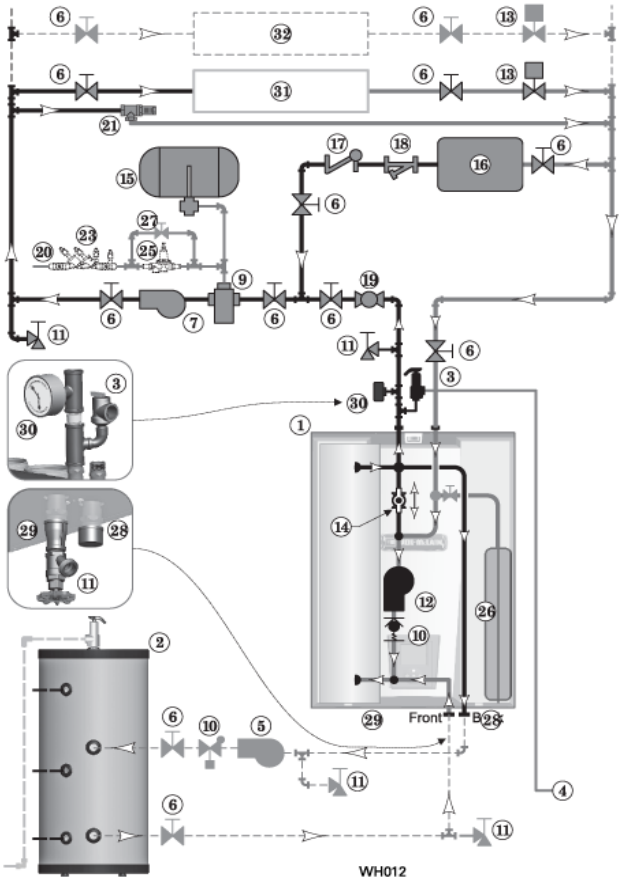
1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 59, page 52) if a DHW tank or CWH is **NOT** connected to the boiler. To provide DHW priority operation in this case, a Weil-McLain WMZV must be used.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 61.

Controlling the zones

1. The WM97+ control can be set up to operate on space heating only or on space heating plus DHW or CWH. Refer to Field wiring, beginning on page 64, for instructions on wiring to zone valves.
2. The boiler and zone valves can also be operated by a Weil-McLain WMZV zone controller.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 61 **WM97+70/110** Chilled water system plus optional DHW piping



NOTICE Connect zone valve end switches to ZONE 2 input. Connect system circulator to CIRC 2 output.

⚠CAUTION Use isolation relays if connected 3-wire zone valve end switches to the WM97+ control inputs.

Legend — Figure 61

1 ■ WM97+70 or 110 boiler
2 Indirect water heater, if used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
7 System circulator
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
13 Zone valves
14 ■ Primary/secondary by-pass valve — see page 40 for information — OPEN: Boiler connected as primary/secondary
15 Supplementary expansion tank, closed type, REQUIRED for chiller systems (some chiller systems may use a diaphragm type expansion tank)
16 Water chiller
17 Check valve
18 Y-strainer
19 Balancing valve
20 Make-up water supply
21 By-pass pressure regulator, RECOMMENDED for zone valve systems unless other provision is made
23 Backflow preventer, if used
25 Pressure reducing valve, if used
26 ■ Internal expansion tank, diaphragm-type
27 Quick-fill valve, if used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

Part number 550-142-120/0113

System piping *(continued)*

WATER CHILLER systems — ZONE VALVES
Internal P/S by-pass valve OPEN
WM97+155 only

See Figure 62

1. **OPEN** the boiler internal primary/secondary by-pass valve.
2. The chiller must be piped in parallel with the boiler.
3. Use appropriate valves to prevent chilled medium from entering boiler.
4. Circulator zoning option — The space heating system can be zoned with circulators if a separate circulator is supplied for the chilled water loop. Install a separate circulator for each zone. The boiler circulator **cannot** be used for a zone. It must remain in the boiler, as installed at the factory.

NOTICE If antifreeze is used in the system, consider the effects of antifreeze on circulator sizing and DHW performance. Some local codes may require double-wall DHW heat exchanger design. Use only the antifreeze listed by Weil-McLain for use with this boiler. See page 88 for details.

⚠WARNING Chilled medium, if used, is piped in parallel with heating boiler as shown in Figure 61. Use appropriate valves to prevent chilled medium from entering boiler. If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle.

Expansion tank

1. Provide a system expansion tank following the guidelines on page 43.
2. DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent.

DHW or CWH, if used

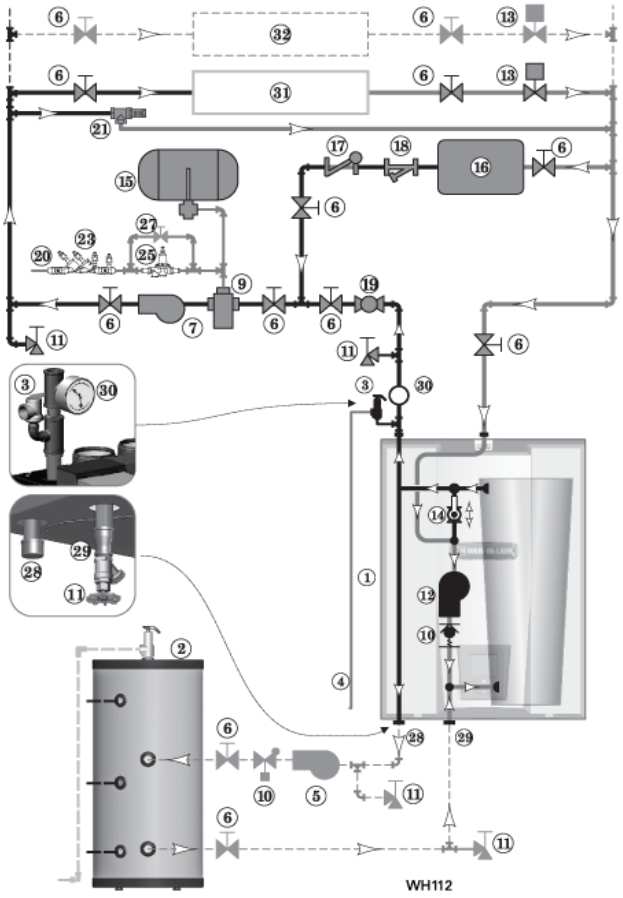
1. DHW or CWH direct connection — Pipe from the boiler's bottom connections to water heater boiler connections as shown. See the CWH manual for CWH piping instructions.
2. DHW tank as a zone — A DHW tank can be piped as a zone (as in Figure 60, page 53) if a DHW tank or CWH is **NOT** connected to the boiler. To provide DHW priority operation in this case, a Weil-McLain WMZV must be used.
3. Priority option — By default, the WM97+ control turns off space heating to its Zone 2 and Zone 3 outputs during domestic water heating on Zone 1. The MAX ON TIME setting can be adjusted to limit how long this occurs. Set the MAX ON TIME to "0" to disable domestic priority.
4. If **NOT** connecting a water heater, terminate the bottom connections as shown in the inset on Figure 62.

Controlling the zones

1. The WM97+ control can be set up to operate on space heating only or on space heating plus DHW or CWH. Refer to Field wiring, beginning on page 64, for instructions on wiring to zone valves.
2. The boiler and zone valves can also be operated by a Weil-McLain WMZV zone controller.

NOTICE DHW refers to an indirect-fired domestic hot water storage tank. CWH refers to a Weil-McLain Companion Water Heater.

Figure 62 **WM97+155** Chilled water system plus optional DHW piping



NOTICE Connect zone valve end switches to ZONE 2 input. Connect system circulator to CIRC 2 output.

⚠CAUTION Use isolation relays if connected 3-wire zone valve end switches to the WM97+ control inputs.

Legend — Figure 62

1 ■ WM97+155 boiler
2 Indirect water heater, when used (for CWH installations, refer to the Weil-McLain CWH manual)
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
7 System circulator
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
13 Zone valves
14 ■ Primary/secondary by-pass valve — see page 41 for information — OPEN: Boiler connected as primary/secondary
15 System expansion tank, closed type, when used (some chiller systems may use a diaphragm type expansion tank)
16 Water chiller
17 Check valve
18 Y-strainer
19 Balancing valve
20 Make-up water supply
21 By-pass pressure regulator, RECOMMENDED for zone valve systems unless other provision is made
23 Backflow preventer, when used
25 Pressure reducing valve, when used
27 Quick-fill valve, when used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

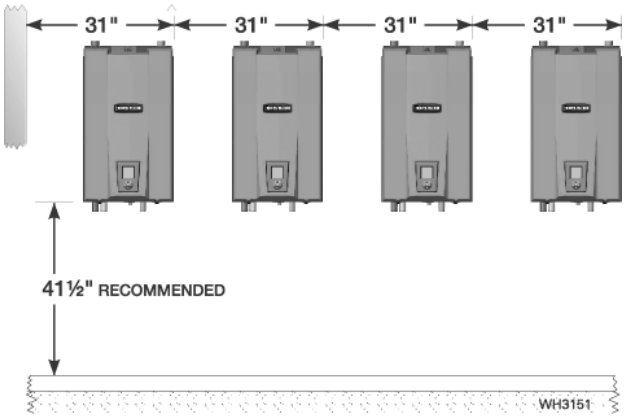
■ = Items supplied with boiler — all other items supplied by installer

Multiple boiler installations

Placing multiple boilers

1. Locate multiple boilers with spacings shown in Figure 63.
2. Provide indicated clearances around boilers for access and servicing. If recommended dimensions are not possible, provide at least the minimum clearances given on page 9. Also follow local codes.
3. The recommended clearance of 41½ inches below the boiler ensures room for further addition of a CWH unit if desired.
4. Provide a minimum 30-inch walkway in front of the boilers to ensure accessibility.
5. Uncrate, assemble and mount boilers according to instructions in this manual.
6. Provide clearance for installation of venting, air piping, gas piping, expansion tank, primary circulator and other accessories.

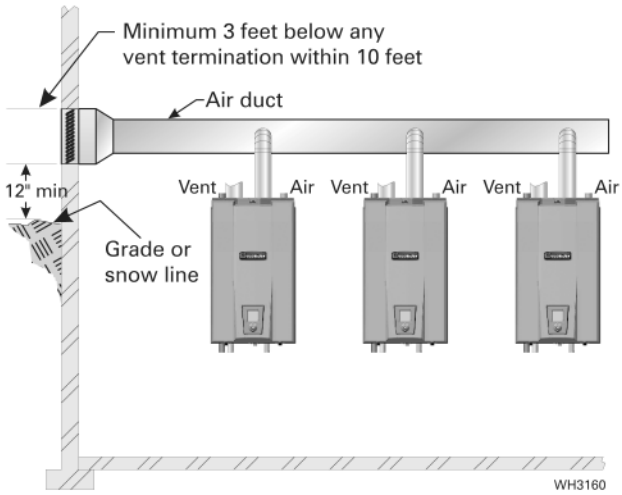
Figure 63 Side-to-side mounting of multiple WM97+ boilers



Manifolded combustion air option

1. Multiple WM97+ boilers can use a common combustion air manifold.
   a. Provide minimum clearance to adjacent vents and grade/snow line as shown in Figure 64.
   b. Provide minimum free area in duct (adjusted for louver restriction) of **1 square inch per 2,000 Btuh** total boiler input (or see Figure 138, page 134).
   c. If combustion air damper is used, wire to boilers to prevent operation except after damper has opened.

Figure 64 Manifolded combustion air option



⚠WARNING ONLY air piping can be combined. DO NOT use combined vent piping. Flue gas leakage and boiler component damage can occur. Failure to comply could result in severe personal injury, death or substantial property damage.

⚠WARNING DO NOT use common venting — the manifold option is only for combustion air — all vent pipes must be routed and terminated individually as described in this manual.

See Figure 138, page 134 for minimum cross sectional area of combined air ducts.

— OR —

⚠WARNING Calculate required cross section (for area in square inches):

MIN. AREA = TOTAL MBH INPUT DIVIDED BY 2

Example: A multiple boiler system with (6) WM97+155 boilers has a total input of 6 x 155 = **930** MBH (930,000 Btuh). The required duct cross sectional area is:

MIN. AREA = 930 DIVIDED BY 2 = 465 sq. inches

Multiple boiler installations *(continued)*

Sequencing multiple WM97+ boilers

1. Use a multiple-boiler controller, such as the Weil-McLain BCP, BMC or BSC, to sequence boilers. Locate temperature sensors as required in the controller manual.

Easy-Fit® piping installation

1. Main header and Easy-Fit® Manifold pipe sizing.
   a. Size system piping as required for the flow.
   b. Install tees or crosses in the system piping for Easy-Fit® manifolds as shown in Figure 65 or Figure 66. Size manifolds to handle total connected boiler output as shown.
2. Provide connections in main header for Easy-Fit® manifolds as close as possible to the midpoint of multiple boilers.
   a. Use tees for four or less boilers, as in Figure 65.
   b. Use either tees (Figure 65) or crosses (Figure 66) for five or more boilers.
3. Manifold placement:
   a. To alternate spacing for supply and return lines to boilers, reverse the short-end and long-end of the manifolds as shown in Figure 65 and Figure 66.
   b. Return manifold must be on the return side of the main and supply manifold must be on the supply side of the main. Drawings in this manual show flow in system main from right to left. For system flowing left to right, reverse the locations of the manifolds accordingly.
4. Connect from Easy-Fit® manifold branches to boiler supply and return connections using copper or steel pipe, sized for the required flow rate.
5. Install an isolation valve on the supply and return of each boiler as shown in the piping diagrams in this manual. Some local codes may require the use of individual water level controls and limits on each boiler because isolation valves are installed.
6. Install main system air eliminator and primary circulator in supply piping as shown in piping diagrams. Place expansion tank on suction side of system circulator as shown.
7. Install system accessories as shown in drawings.
8. Piping recommendation drawings:
   a. Figure 65 and Figure 66 show details of Easy-Fit® manifolds.
   b. Figure 67, page 58 is a schematic piping drawing showing the locations of typical boiler piping and system piping, including limits and other devices often required by local codes.
   c. Figure 68, page 59 and Figure 69, page 60 are three-dimensional piping drawings of typical multiple boiler installation.
   d. Figure 70, page 61 shows recommended piping when an isolating heat exchanger is needed.
9. If desired, other primary/secondary piping arrangements can be used.

NOTICE **The boiler internal primary/secondary by-pass valve must be CLOSED** for multiple boiler installations piped as shown in this manual. This allows the boiler internal circulator to circulator water to and from the manifolds.

Maximum connected load per manifold:
2-inch manifold — 450 MBH
3-inch manifold — 1400 MBH
4-inch manifold — 2900 MBH

Figure 65 Single-sided EZ-Fit Header connection

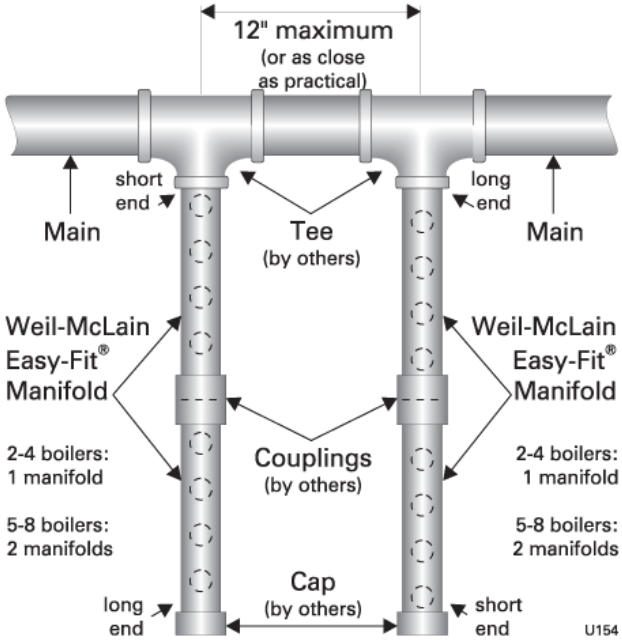
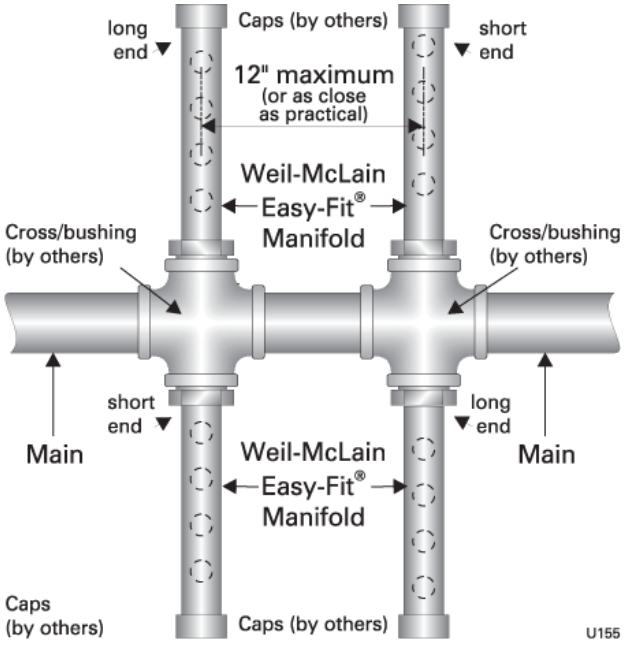
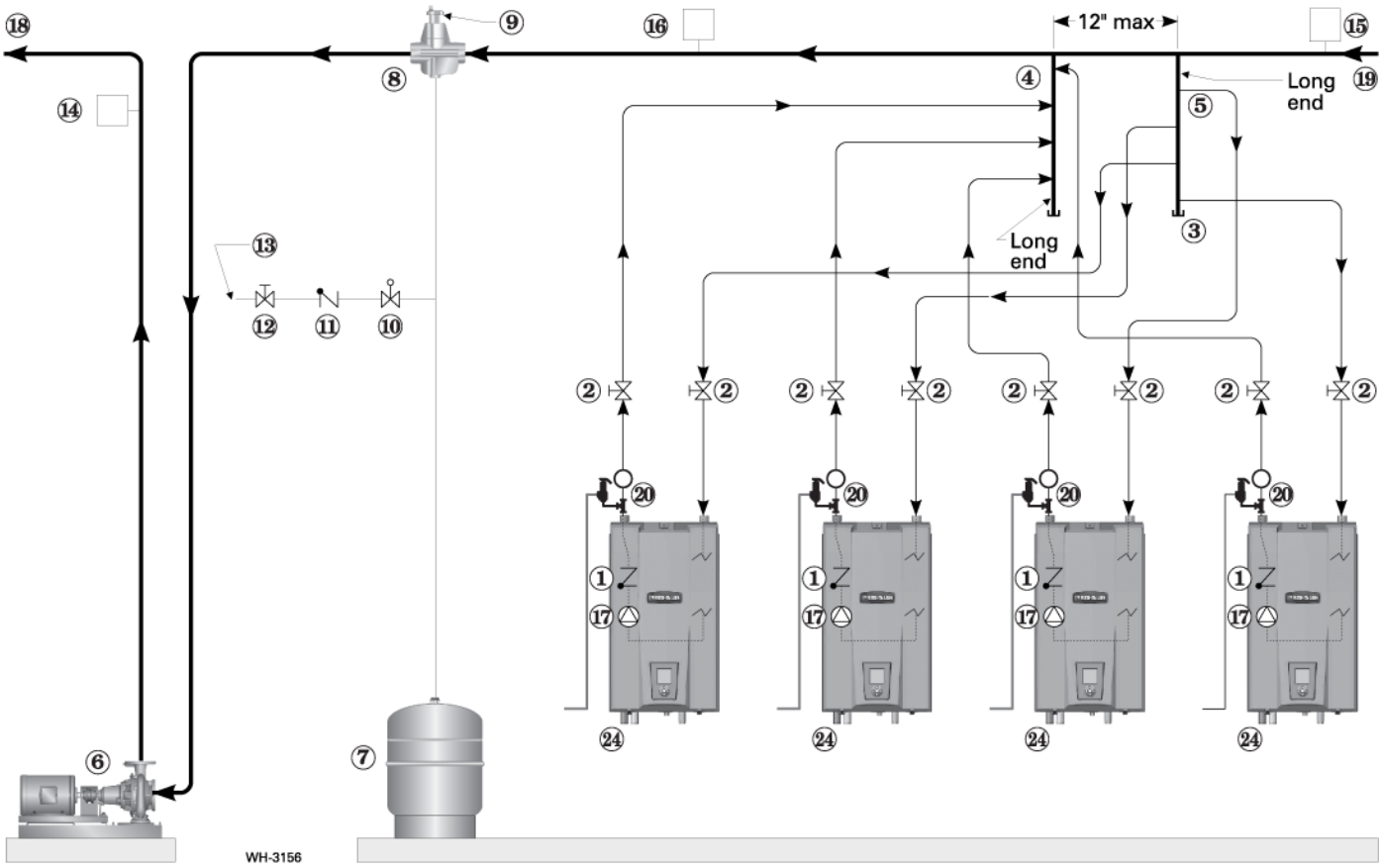


Figure 66 Double-sided EZ-Fit Header connection



Multiple boiler installations *(continued)*

Figure 67 Piping schematic — typical piping for multiple WM97+ boilers, using Weil-McLain Easy-Fit manifolds (shown using WM97+155 boilers — adjust boiler connections as required for other boiler models)



Legend — Figure 67

NOTICE **The boiler internal primary/secondary by-pass valve must be CLOSED** for multiple boiler installations piped as shown in this manual. This allows the boiler internal circulator to circulator water to and from the manifolds.

1 Flow/check valve (integral to each boiler internal circulator)

2 Isolation valves (when used)

3 Cap

4 Easy-Fit® Manifold (supply) — layout and size per page 57

5 Easy-Fit® Manifold (return) — layout and size per page 57

6 Primary circulator

7 Expansion tank (diaphragm type)

8 System air eliminator

9 System automatic air vent

10 Pressure reducing valve

11 Check valve or backflow preventer, as required by applicable codes

12 Isolation valve

13 Cold water supply

14 Supply water temperature control (when used)

15 Low water cutoff (when used) (place above primary header)

16 Water flow switch (when used)

17 Internal boiler circulator

18 System supply

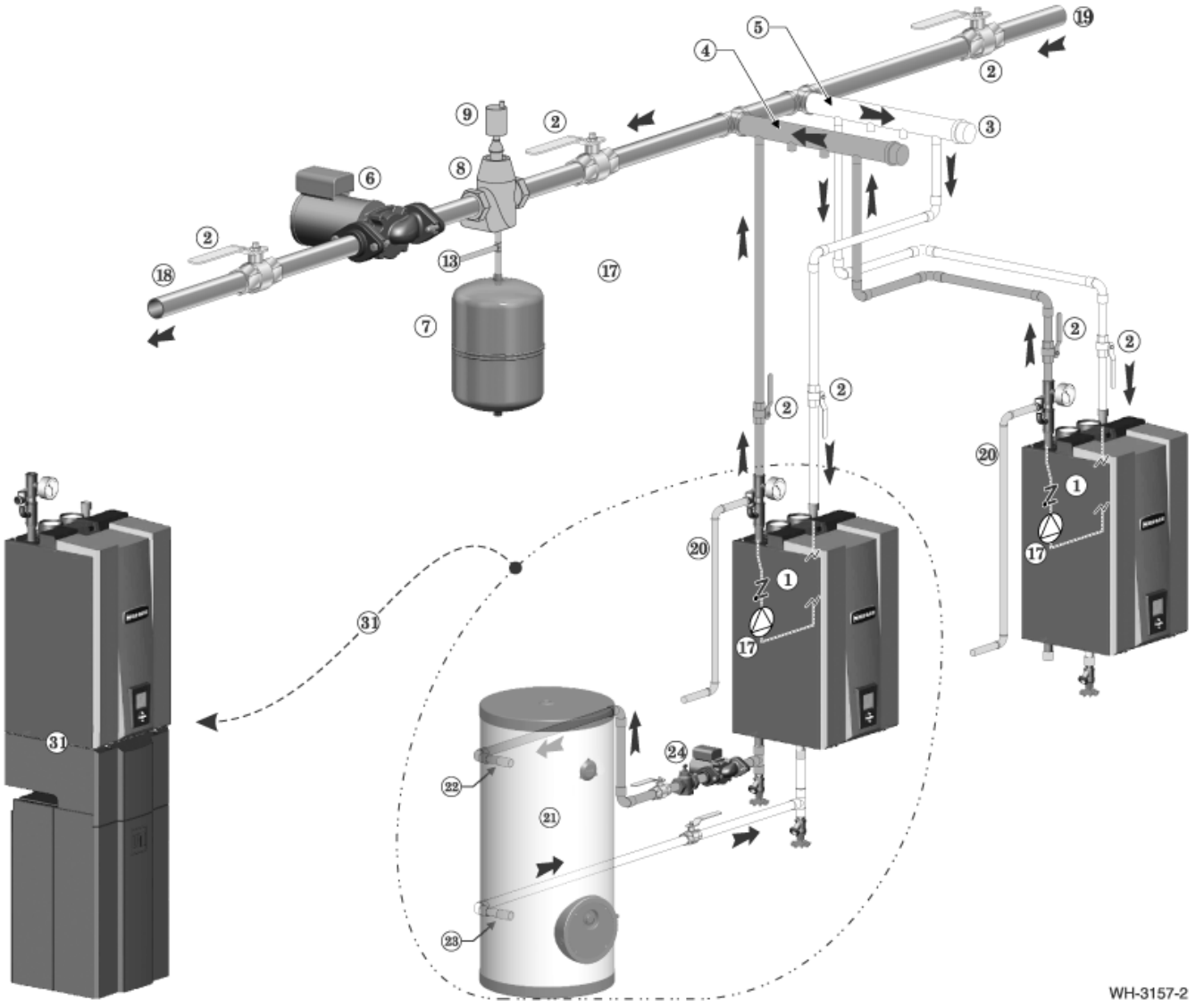
19 System return

20 Boiler P/T gauge, relief valve and discharge piping, installed per WM97+ Boiler Manualore than 3 feet) from boiler connection tees.

24 DHW connections — pipe with drain valve and cap as shown on page 13 if boiler is not directly connected to a DHW unit. For CWH installations, refer to the CWH manual for piping the CWH to the WM97+ boiler bottom connections.

Multiple boiler installations *(continued)*

Figure 68 Piping layout — typical piping for multiple WM97+ boilers, using Weil-McLain Easy-Fit manifolds (2-boiler system) (shown using WM97+155 boilers — adjust boiler connections as required for other boiler models)



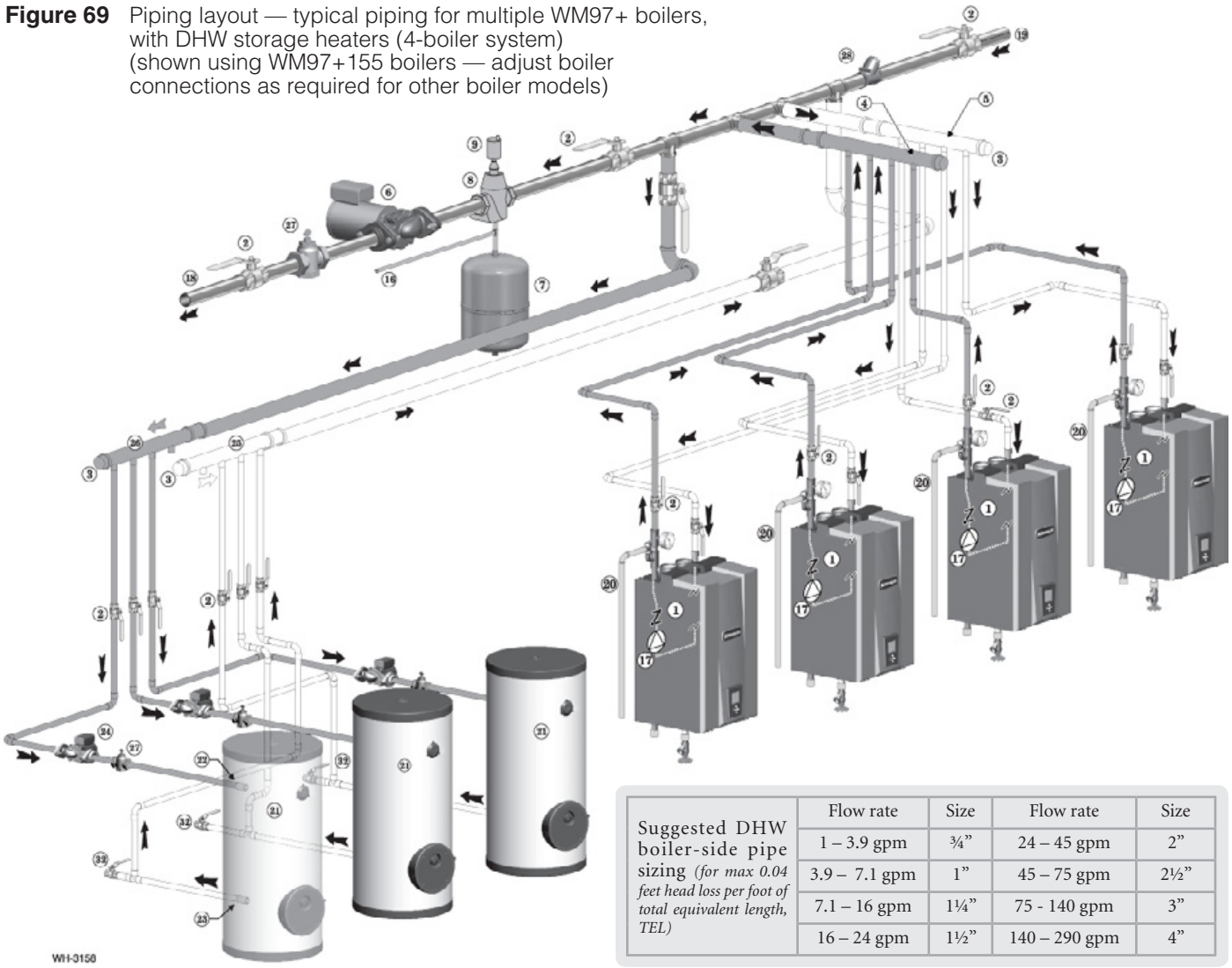
Legend — Figure 68

NOTICE **The boiler internal primary/secondary by-pass valve must be CLOSED** for multiple boiler installations piped as shown in this manual. This allows the boiler internal circulator to circulator water to and from the manifolds.

1 Flow/check valve (integral to each boiler internal circulator)
2 Isolation valves (when used)
3 Caps
4 Easy-Fit® Manifold (supply) — layout and size per page 57
5 Easy-Fit® Manifold (return) — layout and size per page 57
6 Primary circulator
7 Expansion tank (diaphragm type)
8 System air eliminator
9 System automatic air vent
13 Cold water supply
17 Boiler circulator — circulates water between boiler and Easy-Fit® Manifolds
18 System supply
19 System return
20 Boiler relief valve and discharge piping, installed per WM97+ Boiler Manual
21 Indirect-fired storage water heaters (Weil-McLain PLUS Line shown) — Example is shown connected to one boiler of the system. Preferably, use the last boiler in the lead/lag sequence and set its Priority to **DHW Direct** so it will switch to DHW firing and turn off its boiler circulator on a call for domestic water heating.
22 DHW boiler water supply, typical
23 DHW boiler water return, typical
24 DHW boiler-side circulator and flow/check valve
31 Alternate DHW method — use Weil-McLain WH97+ with Companion Water Heater (CWH)

Multiple boiler installations *(continued)*

Figure 69 Piping layout — typical piping for multiple WM97+ boilers, with DHW storage heaters (4-boiler system) (shown using WM97+155 boilers — adjust boiler connections as required for other boiler models)



Suggested DHW boiler-side pipe sizing *(for max 0.04 feet head loss per foot of total equivalent length, TEL)*	Flow rate	Size	Flow rate	Size
	1 – 3.9 gpm	¾"	24 – 45 gpm	2"
	3.9 – 7.1 gpm	1"	45 – 75 gpm	2½"
	7.1 – 16 gpm	1¼"	75 - 140 gpm	3"
	16 – 24 gpm	1½"	140 – 290 gpm	4"

Legend — Figure 69

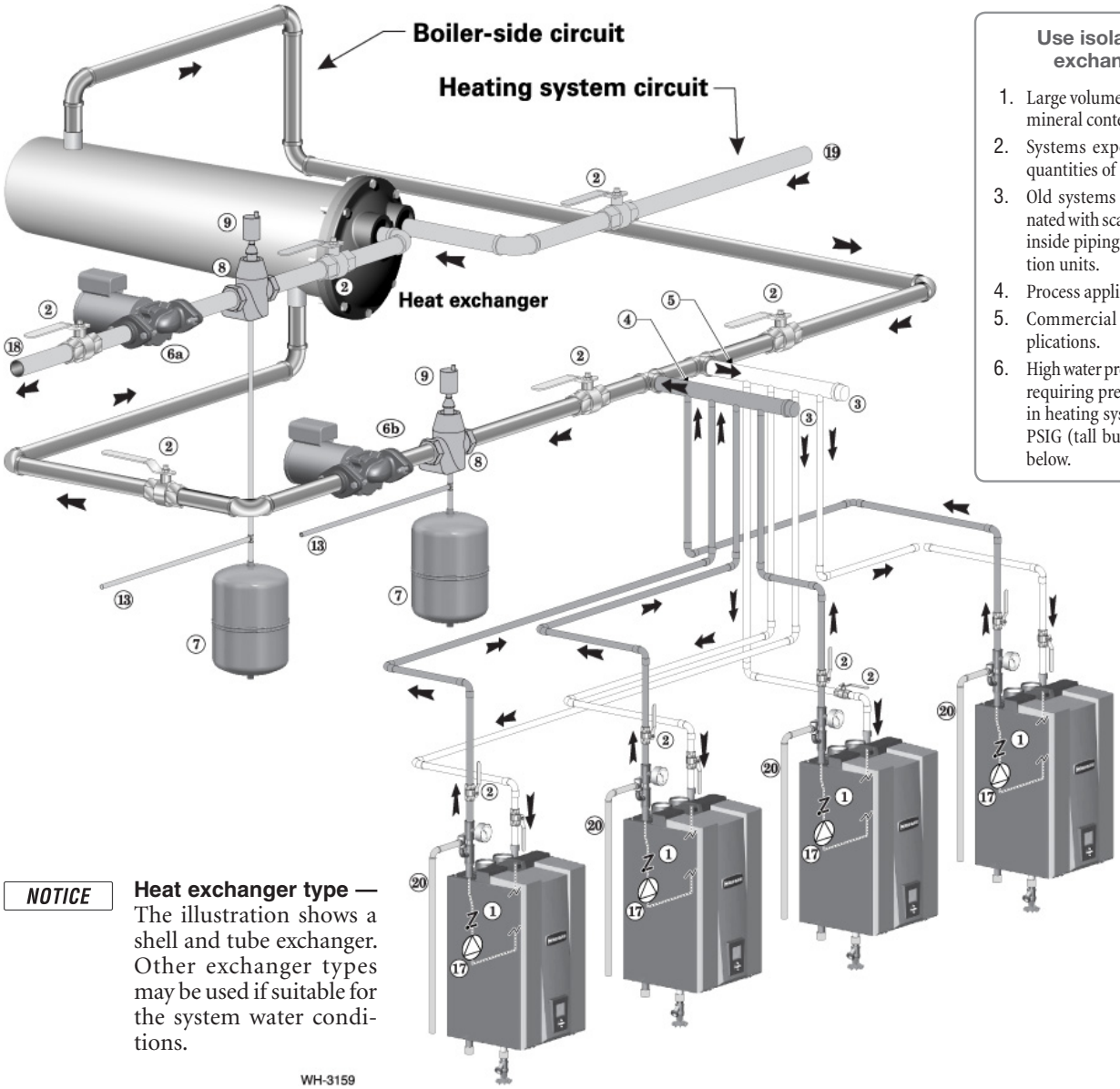
1 Flow/check valve (integral to each boiler internal circulator)
2 Isolation valves (when used)
3 Caps
4 Easy-Fit® Manifold (supply) — layout and size per page 57
5 Easy-Fit® Manifold (return) — layout and size per page 57
6 Primary circulator
7 Expansion tank (diaphragm type)
8 System air eliminator
9 System automatic air vent
13 Cold water supply
17 Boiler circulator — circulates water between boiler and Easy-Fit® Manifolds
18 System supply
19 System return
20 Boiler relief valve and discharge piping, installed per WM97+ Boiler Manual
21 Indirect-fired storage water heaters (Weil-McLain PLUS Line shown) — Example is shown with reverse-return boiler-side piping using a single circulator. Alternate: each water heater could have its own circulator.
22 DHW boiler water supply, typical
23 DHW boiler water return, typical
24 DHW boiler-side circulators
25 DHW boiler-side supply Easy-Fit® Manifold
26 DHW boiler-side return Easy-Fit® Manifold
27 Flow/check valves (to prevent induced or gravity flow in heating system or DHW piping)
28 Check valve to prevent heat migration in heating system
29 See water heater manual for DHW piping — The DHW piping must also be manifolded together since the boiler-side piping is manifolded. If DHW heaters supply separate DHW circuits, provide an individual circulator for each water heater, and control each circulator by its water heater's aquastat.
32 Drain valves for DHW boiler water piping

NOTICE **The boiler internal primary/secondary by-pass valve must be CLOSED** for multiple boiler installations piped as shown in this manual. This allows the boiler internal circulator to circulator water to and from the manifolds.

NOTICE This piping is suggested only. The layout above should be controlled with a boiler sequencing panel that provides DHW operation as well. Wire the heating system circulator to operate only on call for heat. Alternatively, use the boiler sequencing panel to provide domestic priority by disabling the heating system circulator any time there is a DHW call for heat. The boiler circulators, item 17, must operate on any call for heat, whether heating system or DHW. Offset the DHW boiler-side supply and return manifolds as shown so the total run of pipe and fittings to each of the water heaters is approximately equal.

Multiple boiler installations *(continued)*

Figure 70 Piping layout — typical piping for multiple WM97+ boilers, using isolation exchanger (shown using WM97+155 boilers — adjust boiler connections as required for other boiler models)



Use isolation heat exchanger for:

1. Large volume systems with high mineral content in water.
2. Systems exposed to untreated quantities of makeup water.
3. Old systems severely contaminated with scale and rust buildup inside piping and heat distribution units.
4. Process applications.
5. Commercial service water applications.
6. High water pressure applications, requiring pressure relief setting in heating system more than 30 PSIG (tall buildings). See notes below.

NOTICE **Heat exchanger type —** The illustration shows a shell and tube exchanger. Other exchanger types may be used if suitable for the system water conditions.

WH-3159

Legend — Figure 70

1 Flow/check valve (integral to each boiler internal circulator)
2 Isolation valves (when used)
3 Cap
4 Easy-Fit® Manifold (supply) — layout and size per page 57
5 Easy-Fit® Manifold (return) — layout and size per page 57
6a Heating system circulator (exchanger tube-side)
6b Heat exchanger shell-side circulator
7 Expansion tanks (diaphragm type)
8 System air eliminator
9 System automatic air vent
13 Cold water supply connections
17 Boiler circulator — circulates water between boiler and Easy-Fit® Manifolds
18 Heating system supply
19 Heating system return
20 Boiler relief valve and discharge piping, installed per WM97+ Boiler Manual

NOTICE **The boiler internal primary/secondary by-pass valve must be CLOSED** for multiple boiler installations piped as shown in this manual. This allows the boiler internal circulator to circulator water to and from the manifolds.

Notes:
1. Contact heat exchanger manufacturer for heat exchanger shell-side and tube-side piping and circulator requirements. Tube-side flow and temperatures must meet heating system requirements.
2. Contact heat exchanger manufacturer for sizing heat exchanger.
3. Heat exchanger shell-side circuit requires its own expansion tank as shown.
4. Heating system circuit requires its own expansion tank, as shown, plus its own relief valve set to protect heating system and heat exchanger piping and components.
5. When individual isolation valves are used, individual boiler and level controls may be required.

Install condensate line

Prepare condensate trap assembly

1. Remove the condensate trap kit from the accessories bag.
2. See Figure 71. The left image shows the complete condensate trap kit.
3. Remove the flexible drain tube nut, item 2.
4. Push the flexible tube gasket ring onto the end of the flexible tube (item 1) as shown in Figure 71. The tube should extend through the gasket (item 3) about ¼ inch.
5. Insert the flexible tube and gasket into the drain fitting. When in position, the offset edge of the gasket ring will rest on the shoulder of the drain fitting as shown in Figure 71, detail 6.
6. Secure the flexible tube in place by screwing on the nut, item 2. Finger tighten securely.

Install the condensate trap assembly

1. Insert the condensate trap ball, Figure 71, item 5 into the trap body (item 4).

⚠WARNING The condensate trap ball MUST be in place in the condensate trap assembly to prevent possible flue gas leakage through the condensate drain system.

2. Loosen the top nut on the trap body.
3. Slide the trap assembly onto the boiler condensate outlet. Firmly hand tighten the upper nut to secure the condensate trap in place.

Condensate drain system

1. **Install condensate drain by connecting tubing or PVC pipe to the flexible drain line. Run the drain tubing or piping to a floor drain or condensate pump**. The flexible drain line will fit in a ¾" PVC coupling. Run minimum ½" PVC for the piping to drain or condensate pump.

NOTICE Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785, F441 or D2665. Cement and primer must comply with ASTM D2564 or F493. For Canada, use CSA or ULC certified PVC or CPVC pipe, fittings and cement.

2. Select a condensate pump (if used) that is approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage. The pump should have a minimum capacity of 2 GPH for the WM97+70, 3 GPH for the WM97+110, or 4 GPH for the WM97+155.
3. When sizing condensate pumps, make sure to include the total load of all appliances connected to it.

⚠CAUTION The condensate line must remain unobstructed, allowing free flow of condensate. If condensate is allowed to freeze in the line or if the line is obstructed in any other manor, condensate can exit from the boiler tee, resulting in potential water damage to property.

NOTICE Condensate from the WM97+ boiler will be slightly acidic (typically with a pH from 3.2 to 4.5). Install a neutralizing filter when draining into metal pipe and if required by local codes. See Replacement parts section at the end of this manual for the Weil-McLain kit.

⚠WARNING The condensate trap must be in place during all operation. Make sure the trap is securely attached to the condensate outlet and that the condensate discharge line is in good condition and installed per this manual. Failure to comply could result in severe personal injury, death or substantial property damage.

Figure 71 Condensate trap assembly

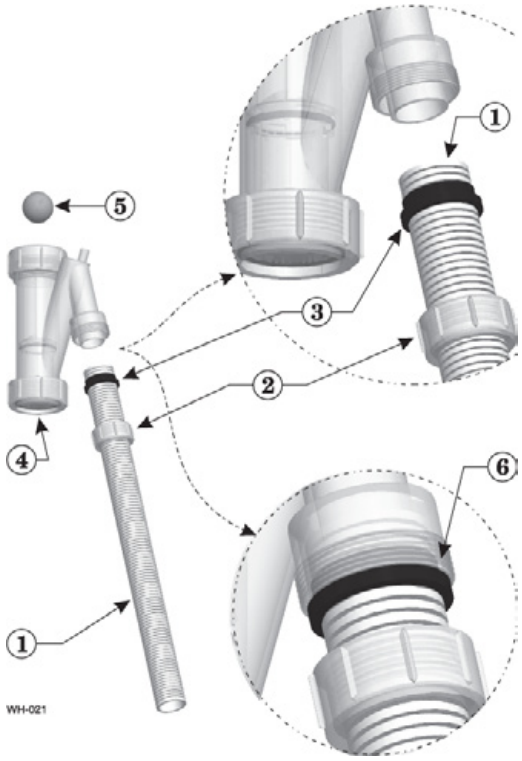
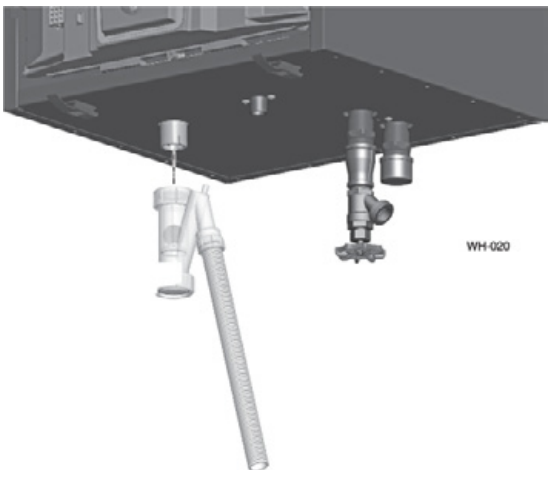


Figure 72 Condensate trap connection (WM97+70/110 shown)



Gas piping

⚠WARNING WM97+ boilers are shipped ready to fire natural gas ONLY. You must install the propane orifice bushing if the boiler will be connected to propane. See page 14. Failure to comply could result in severe personal injury, death or substantial property damage.

⚠WARNING **Use two wrenches** when tightening gas piping at boiler, using one wrench to prevent the boiler gas line connection from turning. Failure to support the boiler gas connection pipe to prevent it from turning could damage gas line components.

Connecting gas supply piping

1. Remove jacket front panel and refer to Figure 73 to pipe gas to boiler.
   a. Place a pipe wrench on the gas line inside the jacket when tightening the gas line assembly to the boiler gas connection (item 1).
   b. Install steel pipe fittings and factory-supplied gas cock as shown in Figure 73. All pipe fittings are supplied by the installer. The gas cock is shipped loose with the boiler.
   c. In Canada — The gas shut-off valve (item 2) must be identified by the installer.
2. Use pipe dope compatible with propane gases. Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

⚠WARNING Failure to apply pipe dope as detailed above can result in severe personal injury, death or substantial property damage.

3. Connect gas supply piping to the ½" NPT gas cock (item 2).
4. Support gas piping with hangers, not by boiler or its accessories.
5. Purge all air from gas supply piping.
6. Before placing boiler in operation, check boiler and its gas connection for leaks.
   a. During any pressure testing at less than 13" (330 mm) w.c., close the gas shutoff valve and disconnect system gas piping. At higher test pressures, disconnect boiler and gas valve from gas supply piping.

⚠WARNING Do not check for gas leaks with an open flame — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.

⚠WARNING DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

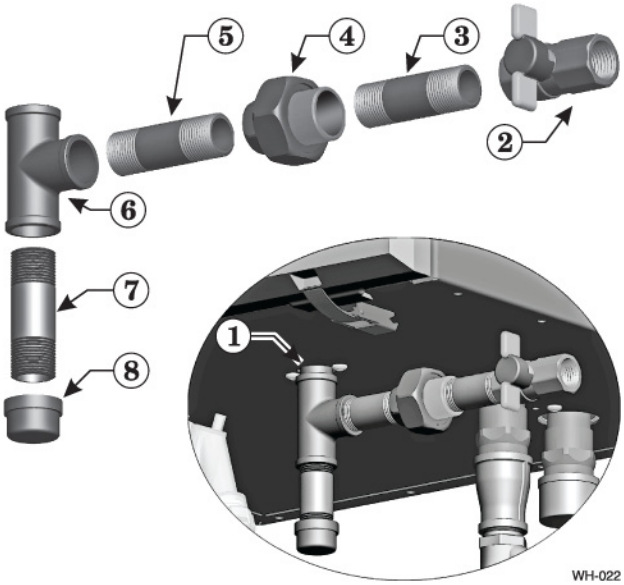
Gas pipe sizing

1. See page 18 for gas line sizing information.

Check gas pressure at inlet to boiler

1. See Figure 100, page 92 (WM97+70/110) or Figure 102, page 93 (WM97+155) for location of the gas inlet pressure test port.

Figure 73 Connect gas supply piping (WM97+70/110 shown)



1 Boiler gas supply connection, ½" NPT male	**NOTICE**
2 T-handle gas cock, ½" NPT, shipped loose with boiler	For installations using a Companion Water Heater (CWH), the gas piping must be routed to pass through the right or left side opening in the CWH piping cover panel. See CWH manual for details.
ALL OF THE FOLLOWING ARE SUPPLIED BY THE INSTALLER:	
3 Nipple, ½" NPT	
4 Union, ½" NPT	
5 Nipple, ½" NPT	
6 Tee, ½" NPT	
7 Nipple, ½" NPT x 4", for drip leg	
8 Cap, ½" NPT	

2. For natural gas or propane, the pressure required at gas valve inlet pressure port (verify minimum gas pressure when all gas appliances are in operation):
   a. Maximum: 13" (330 mm) w.c. with no flow (lockup) or with boiler on.
   b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire) — WM97+70: 3½" (89 mm) w.c.; WM97+110: 4½" (114 mm) w.c.; WM97+155: 3½" (89 mm) w.c.
3. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 13" (330 mm) w.c. at any time. Adjust lockup regulator for 13" (330 mm) w.c. maximum.

Field wiring

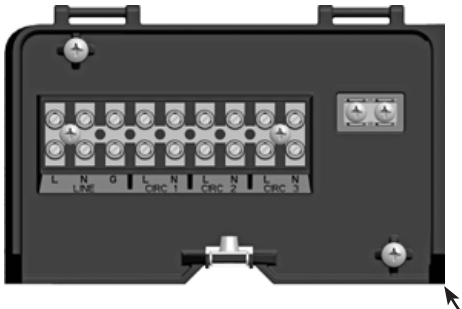
⚠WARNING **ELECTRICAL SHOCK HAZARD** — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE The installation must comply with:

National Electrical Code and any other national, state, provincial or local codes or regulations. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

NOTICE Wiring must be N.E.C. Class 1. If original wiring as supplied with boiler must be replaced, use only type 105 °C wire or equivalent. Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

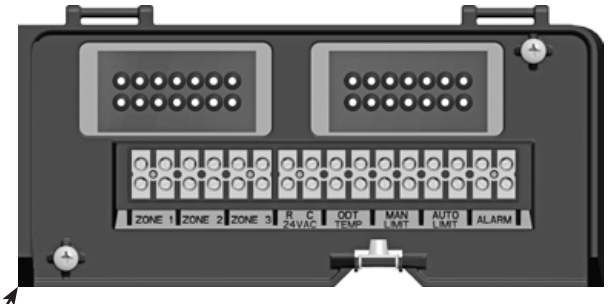
Figure 74 Field wiring overview (see Figure 77, page 67 and Figure 78, page 68 for detailed schematic and ladder wiring diagrams) (top view shown at bottom right is of WM97+70/100 — electrical entrances for WM97+155 are the same)



Line voltage wiring terminals

See Figure 75, page 65 for wiring instructions.

The terminals include the 120-VAC power input and three 120-VAC outputs (for circulators or other system devices).



Low voltage wiring terminals

See Figure 76, page 66 for wiring instructions.

The terminals include three thermostat/end switch inputs (zones 1, 2 and 3), 24-VAC power for thermostats (if needed), external limit inputs, alarm contact and outdoor sensor — see page 133.

WM97+ wiring

Terminals

All field wiring is made to the two electrical connection panels on top of the boiler. Line voltage, 120 VAC, terminals are on the left. Low voltage, 24 VAC, terminals are on the right.

Wire entrances

Wire entrance knockouts are in the top center of the electrical enclosure.

⚠WARNING As shown in the warning at right, DO NOT use sharp objects to punch out the wiring knockouts. Wires routed under these knockouts could be damaged. Use ONLY a ball peen hammer to punch out the knockouts.

WM97+ control setup

WM97+ control setup depends on system design and control intent. See instructions on the following pages.

Field wiring *(continued)*

Line voltage wiring (120 VAC)

Make the following line-voltage connections, some of which depend on your system and how the WM97+ control will be programmed. The callouts below refer to Figure 75.

A 120-VAC Power input

1. Provide and install a fused disconnect or service switch (15-ampere rated recommended) as required by applicable codes.
2. Connect minimum **15-ampere, 120 VAC** power wiring to WM97+ boiler line voltage terminal strip as shown in Figure 75.
3. If possible, provide a surge suppressor in the supply power line. This will reduce the possibilities of WM97+ control damage due to line surges.

B Ground wire connection terminal block

1. Ground wires must be terminated with **¼-inch** female spade terminals.
2. Connect ground wires to the grounding block, item **B**.

C Zone 1 output (CIRC1), 120 VAC (DHW circuit, if DHW used)

1. The WM97+ control provides 120-VAC outputs for up to three zones.

NOTICE The WM97+ control default setting is for three space heating zones. The control settings must be changed to operate on DHW.

2. Control options require that DHW tanks be controlled from Zone 1 if domestic water priority is required.
3. ALWAYS connect the DHW circulator to Zone 1 if domestic priority is required. This can be done if the DHW tank is piped to the DHW connections out the bottom of the WM97+ or if the DHW tank is piped as a separate zone in a circulator-zoned system.
4. Zone 1 can be used to provide 120 VAC to a zone circulator if DHW is not used.

D Zone 2 output (CIRC2), 120 VAC

1. Use the Zone 2 output to:
   a. Provide 120 VAC to a system circulator (such as on a zone valve system with system circulator).
   b. Provide 120 VAC to a zone circulator.
   c. Provide 120 VAC to a relay coil, with the relay contact used to enable/disable another device.
2. The WM97+ control will activate Zone 2 if the Zone 2 thermostat or input device calls for heat, after DHW heating (if used) is satisfied.

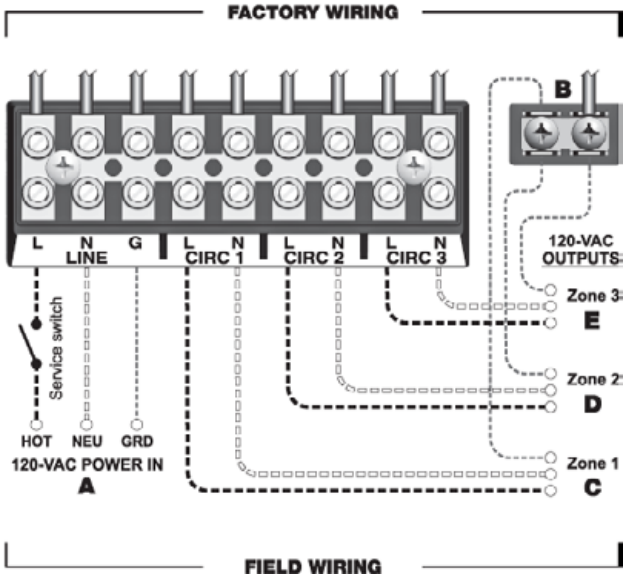
E Zone 3 output (CIRC3), 120 VAC

1. Same as Zone 2. This output is not used for zone valve systems.

Activating system zoning controls

1. To activate system controls (zoning panels, building management controls, etc.):
   a. Use the output from Zone 1 to directly control the DHW circulator. Connect the Zone 2 output to an isolation relay.
   b. Use the relay contact to enable/disable the system space heating controls.
   c. This allows the WM97+ control to provide domestic priority and outdoor reset control of supply water temperature to maximize boiler efficiency.

Figure 75 WM97+ **line voltage** input and output connections (120 VAC)



NOTICE **CWH applications, if installed** — CIRC1 and ZONE1 circuits are dedicated to the Weil-McLain Companion Water Heater and cannot be used for other purposes. See CWH manual for details

WARNING **Output circuits are 120 VAC. If an output is to operate a low voltage circuit, use an isolation relay.**

WARNING **CIRCULATOR POWER — The maximum allowable current for each circulator is 2.2 amps at 120 VAC.**

For circulators with higher amp ratings, you must install a circulator relay or starter to provide line voltage to the circulator. For circulators rated over 2.2 amps, connect only the circulator relay or starter coil to the WM97+ circulator terminals.

NOTICE **WIRING INFORMATION** — See Figure 74, page 64 for wiring connection locations. See Figure 77, page 67 for the complete schematic wiring diagram. See Figure 78, page 68 for the complete ladder wiring diagram.

Field wiring *(continued)*

Low voltage wiring (24 VAC)

Make the following low-voltage connections, some of which depend on your system and how the WM97+ control will be programmed. The callouts below refer to Figure 76.

H Zone 1 call for heat (space heating or DHW circuit)

1. The WM97+ control provides inputs for up to three zones.

NOTICE The WM97+ control default setting is for three space heating zones. The control settings must be changed to operate on DHW. If operating on space heating only, the Zone 1 output can be used as described for Zone 2.

2. Control options require that DHW tanks be controlled from Zone 1 if domestic water priority is required.
3. ALWAYS connect DHW aquastat to Zone 1 input if domestic priority is required. This can be done if the DHW tank is piped to the DHW connections out the bottom of the WM97+ or if the DHW tank is piped as a separate zone in the system.

J Zone 2 call for heat (space heating)

1. Use the Zone 2 input to:
   a. Connect the thermostat for a space heating zone.
   b. Connect end switch wire(s) (must be ISOLATED contacts) to start boiler on a call for space heating.
   c. Connect system control input for space heating call for heat (ISOLATED contact only).
2. The WM97+ control will activate the 120-VAC Zone 2 output if the Zone 2 thermostat or input device calls for heat, after DHW heating is satisfied.

K Zone 3 call for heat (space heating)

1. Same as Zone 2. Zone 3 is not used for zone valve systems.

M Outdoor temperature sensor (for outdoor reset)

1. The WM97+ control provides programmable options if using an outdoor temperature sensor. This sensor is supplied with the boiler. **The outdoor sensor must be installed unless specifically exempted in the Energy Act statement on page 133.**
2. Mount the outdoor sensor on an exterior wall, shielded from direct sunlight or flow of heat or cooling from other sources. The wire outlet on the sensor must be oriented DOWN to prevent water entry.
3. Connect the sensor leads to the ODT TEMP terminals, as shown in the wiring diagrams. Thermostat wire can be used to connect the sensor.

N External limits (will cause manual reset when opened)

1. Connect isolated contacts of external limits across the MAN LIMIT terminals to cause the WM97+ control to lock out (requiring manual reset) if the limit opens. The limit must close and the control must be re-started using the procedure given in this manual.

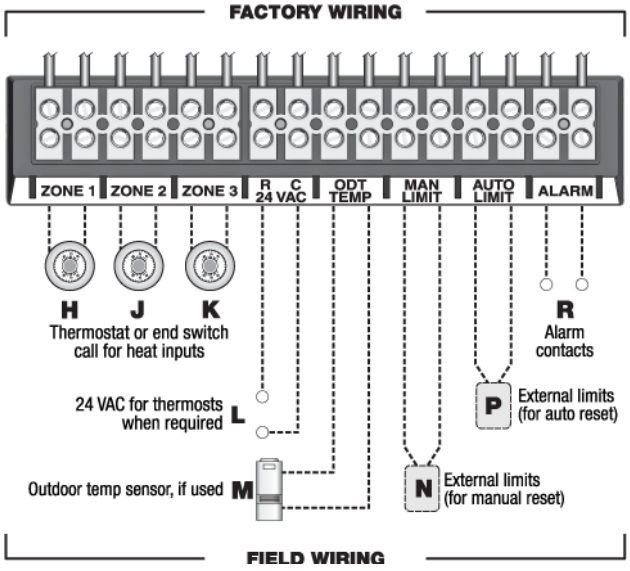
P External limits (will cause automatic reset if opened)

1. Connect isolated contacts of external limits across the AUTO LIMIT terminals to cause the WM97+ control to shut down the boiler on limit opening, then automatically restart after the limit closes.

R Alarm terminals

1. The alarm contacts will close if the WM97+ control enters lockout. Contacts will remain closed until the WM97+ control is reset.
2. Alarm contacts are isolated and are rated 1 amp at 24 VAC.

Figure 76 WM97+ **low voltage** input and output connections (24 VAC)



⚠WARNING **Thermostats** — **DO NOT** supply 24-volt power to the thermostat circuits (H, J and K in Figure 76) or attempt to supply 24 volts for any other application.

DO NOT connect any device to ZONE1 if using **CWH** unit. This circuit is dedicated to the water heater.

For thermostats that require a continuous 24-volt power source, connect the thermostat power input to the "R-C 24 VAC" terminal of the lower voltage terminal strip.

Zone valves — If using 3-wire zone valves, use relays to provide dry contacts to the WM97+ control thermostat connections. The zone valve end switches of 3-wire valves carry 24 VAC from the valve.

Thermostat anticipator setting — 0.1 amps.

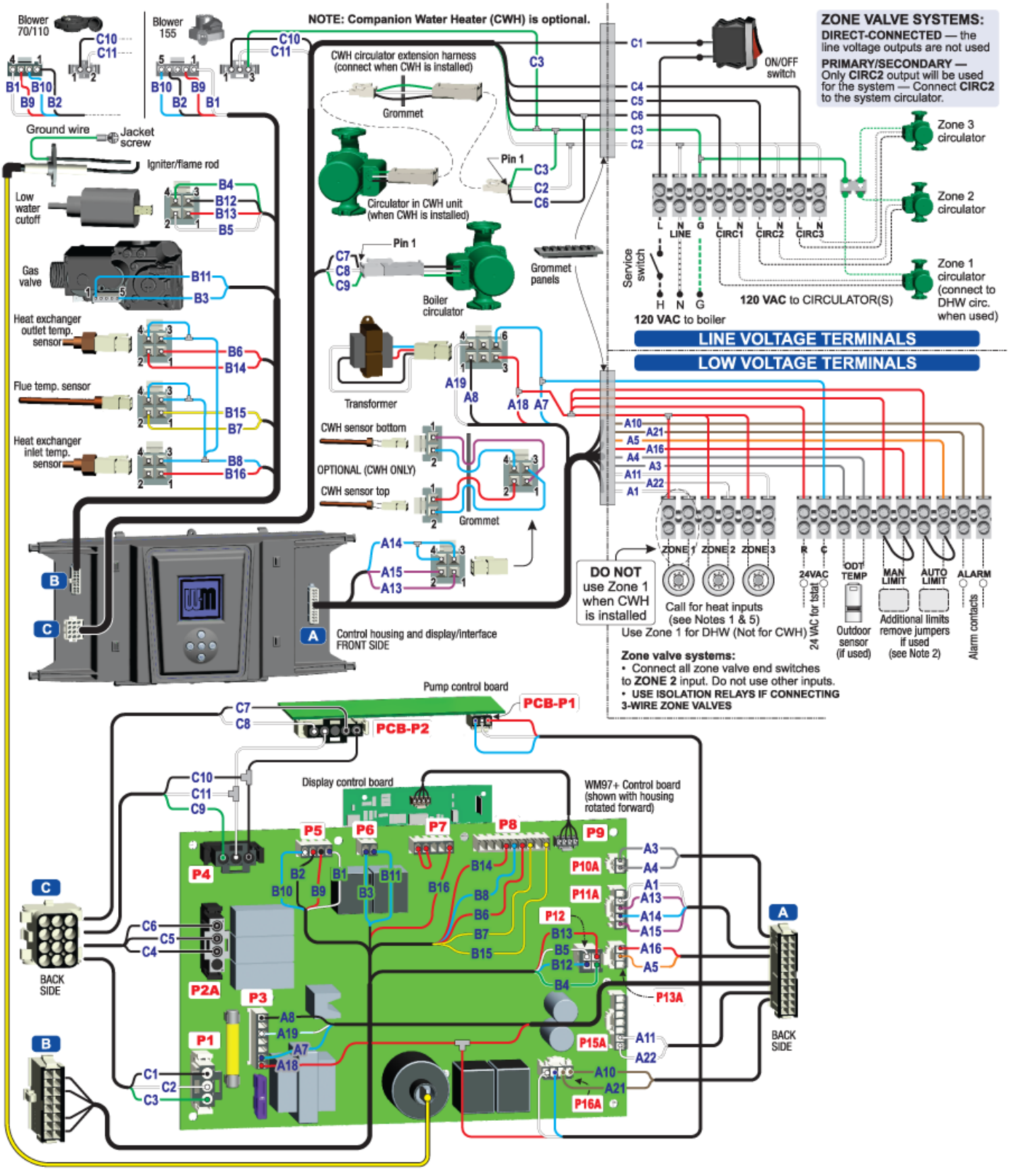
NOTICE **WM97+ control factory default settings:** DHW heating is configured for direct piping to the bottom of the boiler. The DHW circulator is powered from Zone 1 on a call from the DHW aquastat (connected to Zone 1 input). With this set-up, the boiler circulator is NOT activated during DHW heating. Zone 2 and Zone 3 are also NOT activated during domestic priority heating on Zone 1.

The factory default for space heating is designed for finned-tube baseboard, and set up to activate Zone 2 and Zone 3 on a call for heat from the zone thermostats.

See instructions on the following pages to adjust the WM97+ control settings to match installation requirements.

Wiring diagram — schematic

Figure 77 WM97+ schematic wiring diagram (see Figure 78, page 68 for legend and notes)



Wiring diagram — ladder

Figure 78 WM97+ ladder wiring diagram (see Figure 77, page 67 for schematic wiring diagram)

WARNING **Electrical shock hazard** — can cause severe injury or death. Disconnect power before installing or servicing.

✱ = Items NOT provided.

All wiring must be installed in accordance with:
U.S.A. — N.E.C. And any other national, state, or local code requirements.
Canada — C.S.A. C22.1 C.E.C. Part 1 and any other national, provincial, or local code requirements.

NOTES *(for Schematic and Ladder Diagrams)*

1. Thermostats: DO NOT supply 24-volt power to the thermostat circuits. If using 3-wire zone valves, use relays to provide dry contacts to the WM97+ control module thermostat connections.

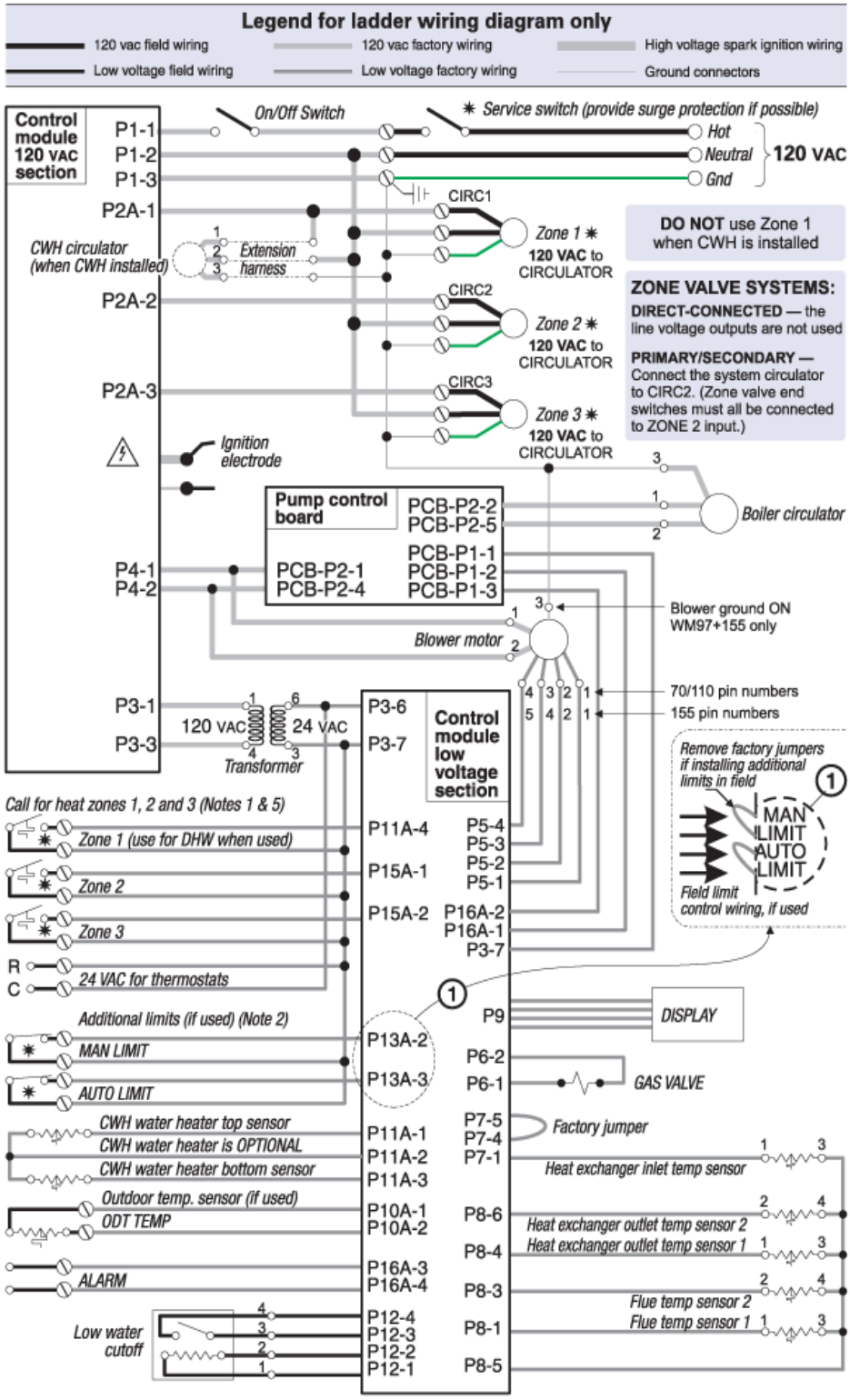
   For thermostats that require a 24-volt power source for continuous clock operation, connect the thermostat power input to the "R-C 24 VAC" terminal of the lower voltage terminal strip.

   Thermostat anticipator setting (single zone) — set anticipator for 0.1 amps.
2. Connect additional limits (if used) across MAN LIMIT terminals if the boiler control module is to manual reset on limit action. Connect across AUTO LIMIT terminals for automatic reset. Remove jumper across terminals used.
3. If any of the original wire as supplied with the appliance must be replaced, use minimum 105 °C wire or equivalent. Exceptions: Ignition lead wire must be obtained from Weil-McLain only.
4. For multiple zoning, use either zone valves or circulators. Refer to the component manufacturer's instructions and this manual for application and wiring suggestions.

   The boiler circulator **MUST** remain in boiler as supplied from the factory, and **CANNOT** be used in the system.
5. Call for heat inputs must be isolated contacts of thermostats or 4-wire zone valve end switches. **Use isolation relays if using 3-wire zone valves.**
6. Refer to component instructions packed with the boiler for application information.
7. Contacts are shown with power OFF.

Connector pin number labels

SCHEMATIC wiring diagram — Connector pin numbers on wires (blue numbers) are pins of the three master connectors on the control housing. These are labeled as A, B and C. At bottom of drawing, the connectors and control boards are shown with the control housing upside down (with control housing rotated forward). **LADDER wiring diagram** — Connector pin numbers shown on control boards are those at the control boards, as labeled on the schematic wiring diagram.



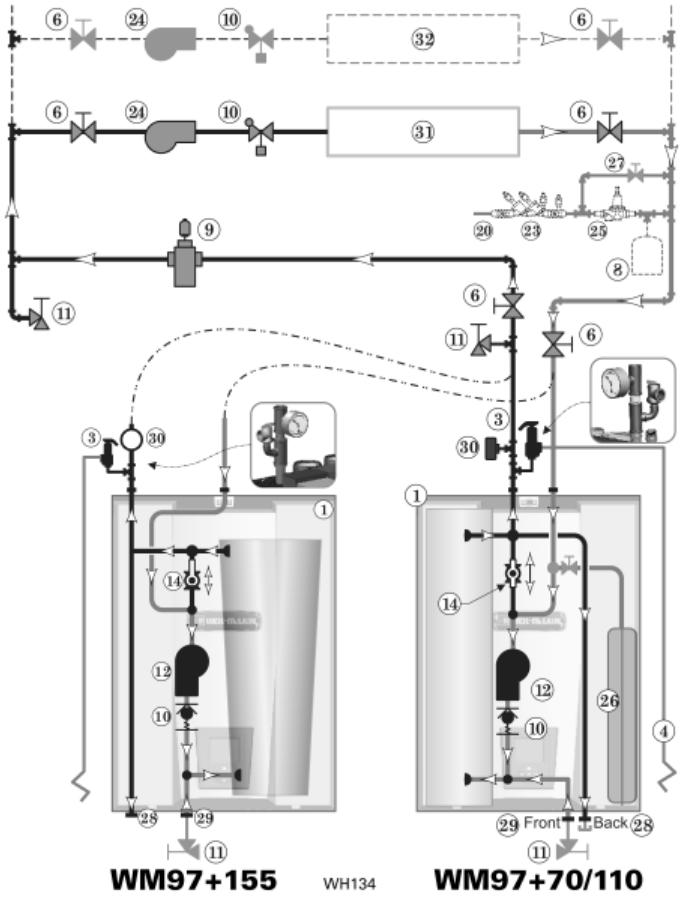
EXPRESS SETUP — using default settings

⚠CAUTION **MANDATORY CONTROL SETTINGS** — The following settings must be checked and adjusted if necessary: BOILER MODEL and HIGH ALTITUDE in BOILER SETTINGS menu. Also enter information at the MAINTENANCE INFO screen. See instructions on the following pages for menu access and control settings.

1. **The WM97+ control is factory set to supply three zones of space heating ONLY. Control settings must be changed to operate a DHW circuit.**
2. All zones use the same temperature settings (or outdoor reset curve if outdoor sensor is connected — see page 133).
3. The terminal units in the system must be finned tube baseboard only. (Other terminal units require changes in the WM97+ control setup.)
4. The control is set up to accept up to three inputs from zone thermostats or end switches.
5. The WM97+ control will regulate boiler outlet water temperature as follows:
   a. Outdoor sensor installed (see page 133):
      180°F at 0°F outside temperature
      130°F at 70°F outside temperature
   b. Outdoor sensor not installed (see page 133):
      180°F fixed target temperature
6. If the system is **zoned with circulators**, follow the guidelines in Figure 79 and guidelines below the illustration.
7. If the system is **zoned with zone valves**, follow Figure 80, page 70 or Figure 81, page 70 Figure 79 and guidelines below each illustration.

⚠CAUTION Use Figure 81, page 70 **ONLY** if the system meets the limitations given on page 44 and page 45. Install a system circulator when applying Figure 80, page 70. Failure to comply could cause system problems.

Figure 79 Using default control settings (**No DHW**) **CIRCULATOR-zoned systems** primary/secondary piping



Legend and guidelines — Figure 79

1. Wire the circulator outputs (CIRC 1, CIRC 2 and CIRC 3) to the zone circulators. See Figure 75, page 65.
2. Wire the zone thermostats to the Zone 1, Zone 2 and Zone 3 inputs on the 24-VAC terminal strip. See Figure 76, page 66.

NOTICE The piping shown is adapted from Figure 55, page 48, **without DHW connected**. The WM97+ control settings would have to be changed to allow DHW operation. Follow all appropriate instructions on page 48.

1 ■ WM97+ boiler

3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information

4 Relief valve piping to drain — see page 39

6 Isolation valves

8 Supplementary expansion tank, diaphragm type, if used

9 Air separator

10 Flow/check valves

11 Purge/drain valves (one drain valve is supplied loose with the boiler)

12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler

14 ■ Primary/secondary bypass valve — see page 40 or page 41 for information — OPEN: Boiler connected as primary/secondary

20 Make-up water supply

23 Backflow preventer, if used

24 Zone circulators

25 Pressure reducing valve, if used

26 ■ Internal expansion tank, diaphragm-type

27 Quick-fill valve, if used

28 Install pipe cap supplied with boiler (see Figure 7, page 13)

27 Install drain valve supplied with boiler (see Figure 7, page 13)

30 ■ Pressure/temperature gauge, supplied with boiler, field piped

31 Heating circuits

32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

EXPRESS SETUP — using default settings *(continued)*

Figure 80 Using default control settings (**No DHW**)
ZONE VALVE-zoned systems
primary/secondary piping

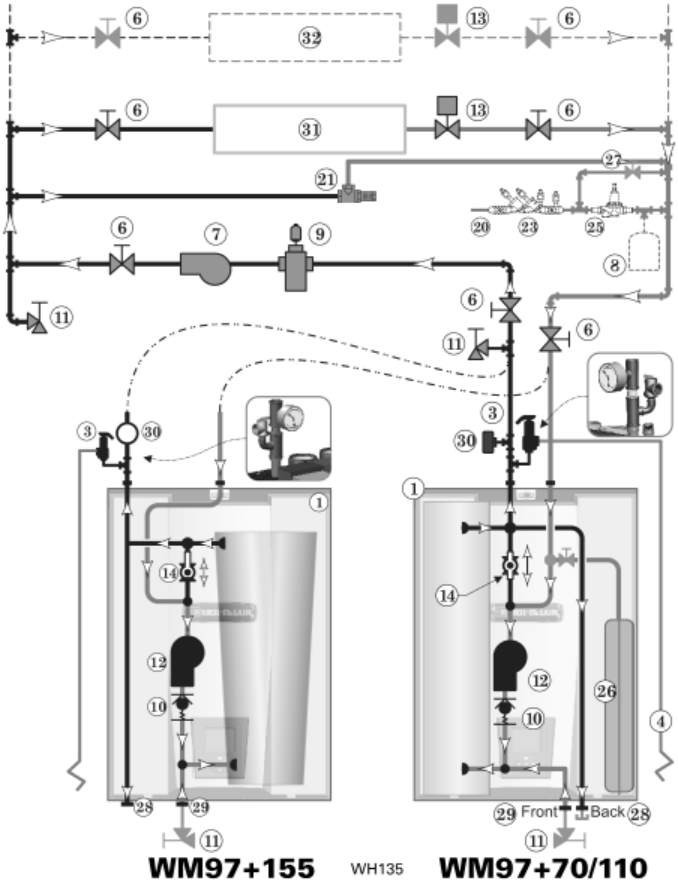
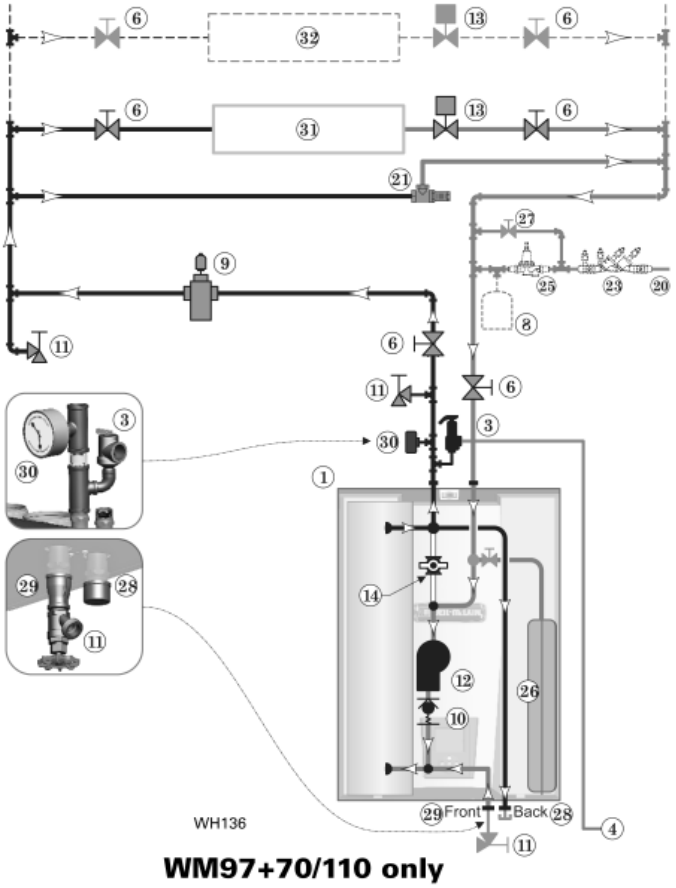


Figure 81 Using default control settings (**No DHW**)
ZONE VALVE-zoned systems
direct connection piping (**NOT** for WM97+155)



Legend and guidelines — Figure 80 and Figure 81

1. **Recommendation**: Wire zone thermostats to zone valves. Wire zone valve end switches to the **ZONE 2** input on the 24-VAC terminal strip. See Figure 76, page 66. Use isolation relays if connecting 3-wire zone valve end switches. Boiler **ZONE 1** and **ZONE 3** are not used.
2. **Figure 80 ONLY** — Wire the **CIRC2** circulator output to the system circulator. See Figure 75, page 65. **CIRC1** and **CIRC3** are not used.

⚠ CAUTION **Use Figure 81 ONLY if the system meets the limitations given on page 44 and page 45. Install a system circulator when applying Figure 80. Failure to comply could cause heat delivery problems.**

1 ■ WM97+ boiler
2 Indirect water heater, if used
3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to boiler supply connection — see page 13 for information
4 Relief valve piping to drain — see page 39
5 DHW circulator
6 Isolation valves
7 System circulator
8 Supplementary expansion tank, diaphragm type, if used
9 Air separator
10 Flow/check valves
11 Purge/drain valves (one drain valve is supplied loose with the boiler)
12 ■ Boiler circulator, with integral flow/check valve, factory installed in boiler
13 Zone valves
14 ■ Primary/secondary bypass valve — see page 40 or page 41 for information — OPEN: Boiler connected as primary/secondary
20 Make-up water supply
21 By-pass pressure regulator, REQUIRED for zone valve systems
23 Backflow preventer, if used
24 Zone circulators
25 Pressure reducing valve, if used
26 ■ 70/110 only — Internal expansion tank, diaphragm-type
27 Quick-fill valve, if used
28 ■ DHW boiler water supply connection, when used — see page 13 for information
29 ■ DHW boiler water return connection, when used — see page 13 for information
30 ■ Pressure/temperature gauge, supplied with boiler, field piped
31 Heating circuits
32 Additional heating circuits, if any

■ = Items supplied with boiler — all other items supplied by installer

Part number 550-142-120/0113

WM97+ control operation

⚠WARNING **Temperature settings** — You must ensure that the WM97+ control is set for the proper water temperatures for the system. Excessive water temperature can cause significant property damage in some applications.

Multi-temperature systems — If the heating system includes circuits that require lower temperature water (radiant slab circuits, for example) as well as higher temperature circuits (DHW, finned tube baseboard, etc.), it is recommended to protect low-temperature circuits with limit controls that are wired to a WM97+ control external limit circuit. Failure to provide regulation can result in substantial property damage.

WM97+ control features

- ❑ Blower speed modulation to control the WM97+ boiler's firing rate.
- ❑ Advanced PID response to anticipate system needs based on response to heat input.
- ❑ Graphic and robust text display for ease of operation monitoring and troubleshooting.
- ❑ Preset operating parameters for typical heating systems (finned tube baseboard, radiant floor, DHW, and others), including target temperatures, reset curves and circulator assignments.
- ❑ Control of up to three circulators or zone devices, assignable for each of the three possible zone inputs. (Boiler circulator controlled internally.)
- ❑ Programmable priority assignment for DHW input.
- ❑ Integral outdoor reset option (see page 133), with reset curves matched to the system type selected.
- ❑ Dual sensors for boiler outlet temperature and flue temperature, providing redundant protection.
- ❑ Integral low water cut-off.
- ❑ Boiler is shipped with an outdoor sensor, allowing outdoor reset operation for maximum boiler efficiency. See page 133.

Sequence of operation

1. Figure 82 is a summary of the operating sequence for the WM97+ control.
2. The symbols shown appear in the display as the WM97+ control cycles the boiler.
3. The wrench symbol appears when a scheduled maintenance date arrives. This informs the homeowner to call the contractor for service.
4. The exclamation mark symbol appears if a problem has been detected.

WM97+ control setup

⚠WARNING **BEFORE PROCEEDING, perform essential control settings as instructed on page 73.**

1. See page 74 for an overview of the WM97+ control menus. This page also gives the location of instruction manual information for each of the main menus.

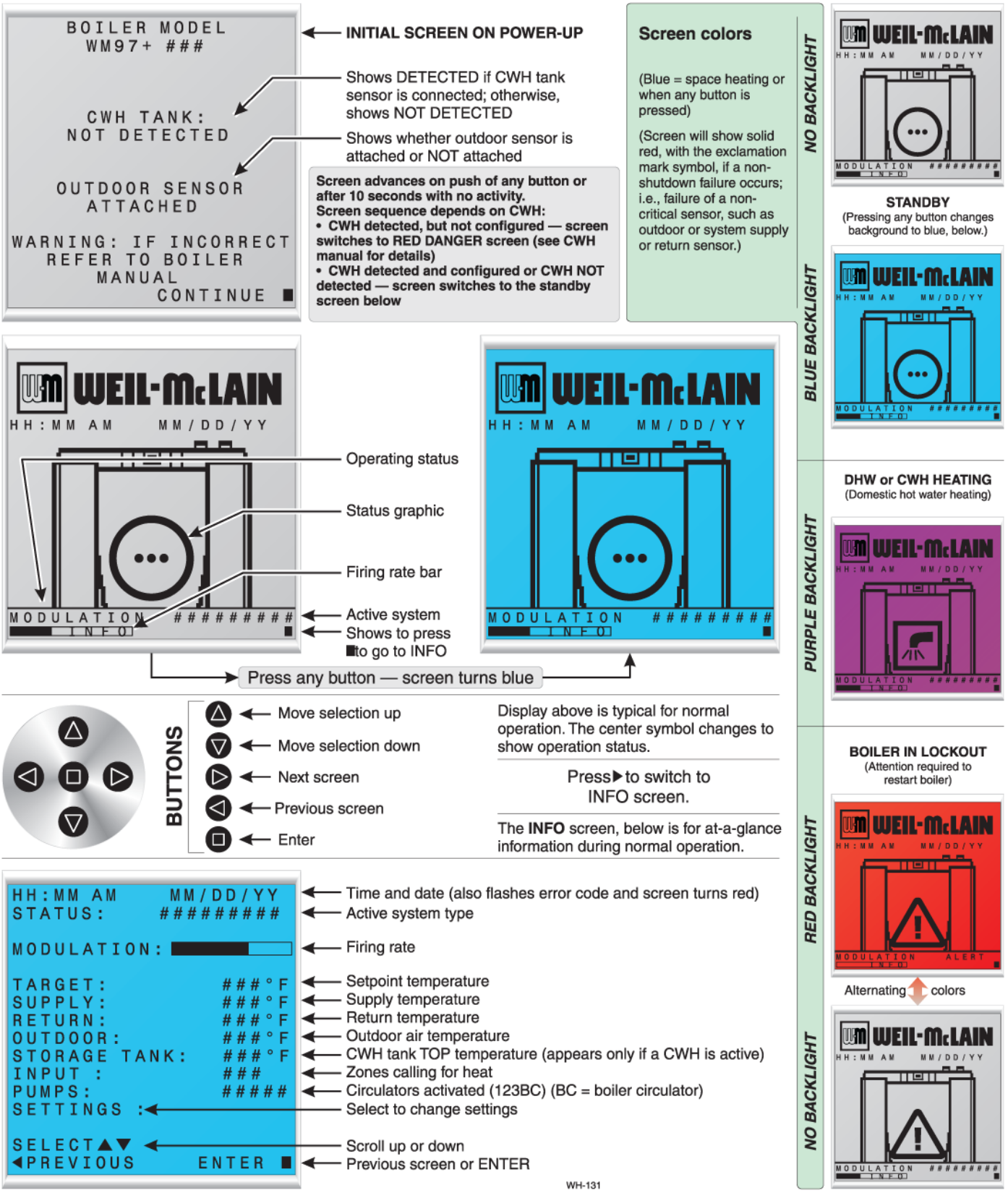
Figure 82 Control sequence of operation

Display status graphic	Control action *(also see Figure 83, page 72)*
POWER UP	• Check the boiler model listed on the power-up screen. If it is not correct, turn off the boiler. See page 75 to change setting. • When power is turned on, the screen lists sensors that are detected. If any sensor is not listed, make sure it is connected correctly. Turn off power and restart.
Standby	• Standby — no calls for heat • Toggles through no dots, 1 dot, 2 dots, then 3 dots while in standby (wrench symbol will show instead if maintenance is needed)
Blower on	• Call for heat detected • Display on with BLUE light (space heating) or PURPLE light (DHW) • Start min/max on timers if more than one system is calling — highest priority starts first • Start circulators for this priority setup • Calculate target temp — If sensor temp is below target temp, begin firing sequence • Blower to ignition speed for prepurge
Ignition on	• After prepurge times out, begin ignition cycle • Activate gas valve and ignition spark • Continue ignition spark for ignition period • Turn off spark and use electrode to check for flame signal
Space heating	• Flame detected • Release boiler to modulation • NOTE: If flame is not detected, the gas valve is turned off, blower turns on (postpurge), and control starts cycle again. After 5 failures, the control waits 60 minutes, then tries again. • If priority timer times out, switch to next priority and start priority timer • If demand satisfied, go to postpurge
DHW heating or CWH	• Flame detected • Release boiler to modulation • NOTE: If flame is not detected, the gas valve is turned off, blower turns on (postpurge), and control starts cycle again. After 5 failures, the control waits 60 minutes, then tries again. • If priority timer times out, switch to next priority and start priority timer • If demand satisfied, go to postpurge
Blower on	• Demand satisfied (temperature reaches target temperature or limit setting) • Gas valve off • Blower to ignition speed for postpurge • Return to standby after purge
Maintenance	• Display turns RED, toggling between graphic screen and maintenance screen (occurs if maintenance schedule timer times out) • Will show during standby only • Boiler operates as normal
Error/fault	• Display turns RED due to error or limit event • Flashing display means lockout condition — display toggles between three screens as in Figure 112, page 104.
WWSD	• Warm weather shutdown — the boiler will not be allowed to fire on space heating if the outside temperature is greater than the WWSD setting. DHW operation is not affected by WWSD.

WM97+ control operation *(continued)*

CWH Installations — See Companion Water Heater manual for additional screen information. When the WM97+ control detects the CWH temperature sensors, it automatically enables the CWH screens and CWH control operation.

Figure 83 WM97+ control display screens and typical navigation



ESSENTIAL settings

⚠WARNING **THE CONTROL SETTINGS LISTED BELOW MUST BE MADE BEFORE STARTING THE BOILER**. Failure to comply could result in incorrect operation of the boiler, causing possible severe personal injury, death or substantial property damage.

Step 1 Read about menu access and navigation on page 74.

Step 2 Turn OFF power to the boiler.

Step 3 Turn off gas supply to the boiler by closing the boiler's manual gas valve.

Step 4 Disconnect thermostat input wires to the boiler at the low voltage terminal block.

Step 5 Turn ON power to the boiler. Turn boiler ON/OFF switch to ON.

Step 6 Navigate to the BOILER SETTINGS / BOILER MODEL screen.

Step 7 Read the boiler model shown on the display.

⚠WARNING If the boiler model number shown does NOT match the boiler, the selection MUST be changed to the correct model number. Failure to comply could result in severe personal injury, death or substantial property damage.

Step 8 Navigate to the BOILER SETTINGS / HIGH ALTITUDE screen.

Step 9 If the boiler is installed at altitude above 5,500 feet, the selection must be changed to YES.

⚠WARNING If the boiler is installed at altitude above 5,500 feet, the high altitude selection MUST be changed to **YES**. Failure to comply could result in severe personal injury, death or substantial property damage.

Step 10 Continue with recommended settings below.

NOTICE **THE CONTROL SETTINGS LISTED BELOW SHOULD BE MADE BEFORE STARTING THE BOILER**. These settings provide information about boiler start-up and service. This information will help reduce troubleshooting time and inform technicians working on the equipment about boiler history.

Step 1 Navigate to the CONTRACTOR MENU / SET DATE AND TIME screen.

Step 2 Enter current date and time by accessing each screen and setting the data.

NOTICE **POWER OUTAGES** — The date and time information will be saved for brief power interruptions. For interruptions longer than 30 minutes, the date and time information will be lost.

Step 3 Navigate to the CONTRACTOR MENU / MAINTENANCE INFO screen.

Step 4 Verify boiler model is shown correctly.

Step 5 Input contractor name, phone, boiler CP#, installed date and interval setting. The interval setting is the time for a maintenance reminder to appear on the display. Press RESET REMINDER to reset the dates.

Step 6 Turn off power to the boiler. Turn boiler ON/OFF switch to OFF. Reconnect thermostat input wires on low voltage terminal strip.

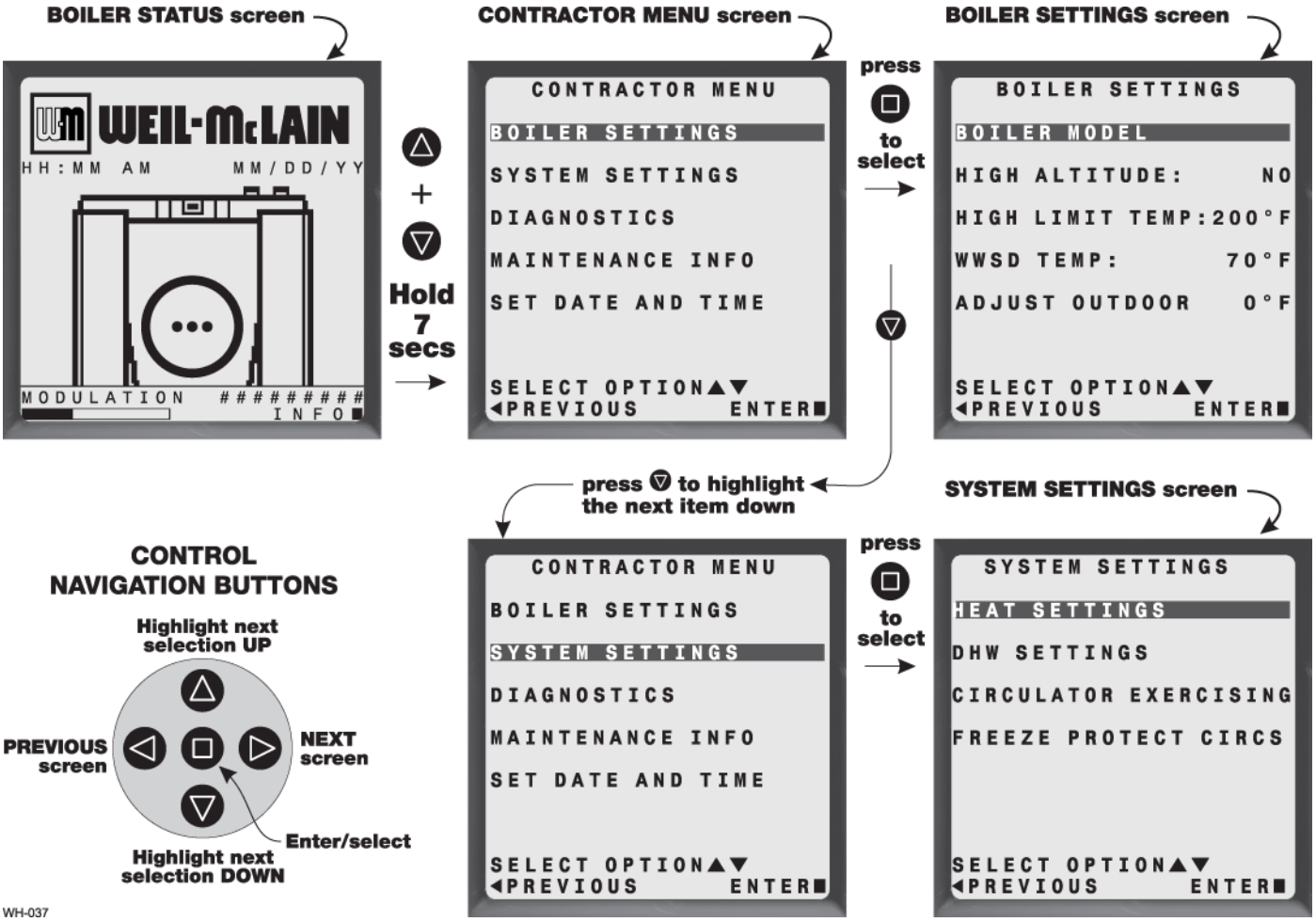
Step 7 To adjust controls settings, proceed to the next page. If settings are complete, proceed with start-up on page 87.

⚠WARNING **CWH Installations —** Follow all instructions in the CWH manual to verify that the mixing valve is installed and operational before proceeding further with the installation. Failure to correctly install the mixing valve and all necessary temperature regulating devices in the system could result in severe personal injury or death.

WM97+ control settings

CWH Installations — See Companion Water Heater manual for additional screen information. When the WM97+ control detects the combi temperature sensors, it automatically enables the CWH screens and CWH control operation.

Figure 84 WM97+ control menu access — accessing contractor menus



⚠WARNING **BEFORE PROCEEDING, perform essential control settings as instructed on page 73.**

Control menus — OVERVIEW

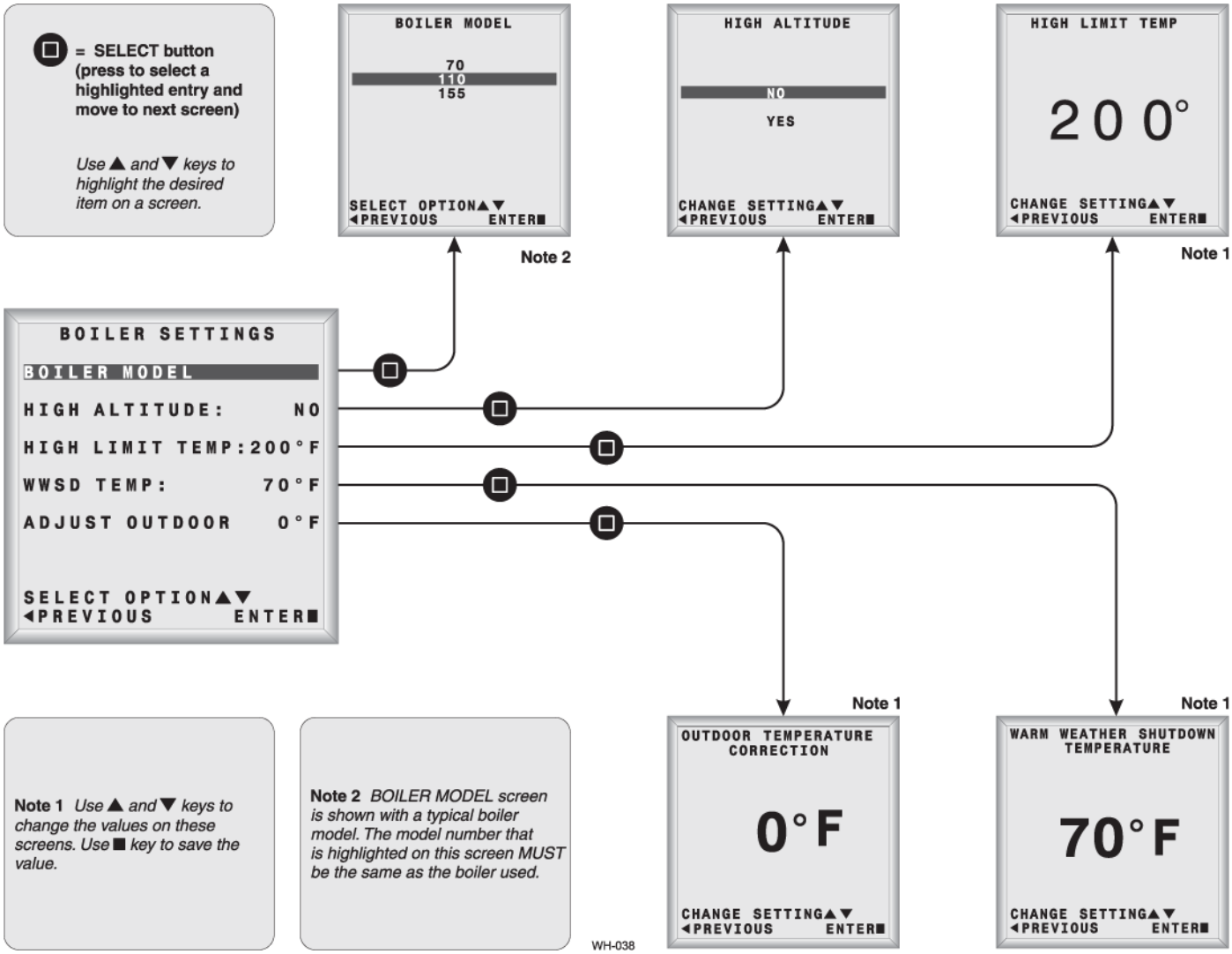
1. Access contractor menus by pressing and holding the UP and DOWN arrow keys at the same time for 7 seconds.
2. See Figure 84 for the screen sequences up to the BOILER SETTINGS and SYSTEM SETTINGS menus.

NOTICE The DHW settings must be modified to allow operation of a DHW circuit. The circuit must be wired ONLY to Zone 1. DHW settings are done in the SYSTEMS SETTINGS / DHW SETTINGS menus.

3. Adjust control settings as needed for the space heating and DHW systems supplied by the boiler.
4. Wire the line voltage and low voltage connections as required.
5. The **CONTRACTOR MENU** screen will show:
   a. **BOILER SETTINGS — see page 75 for details**
   b. **SYSTEM SETTINGS — see below**
   c. **DIAGNOSTICS — see page 83**
   d. **MAINTENANCE INFO — see page 73 and page 86**
   e. **SET DATE AND TIME — see page 73 and page 86**
6. The **SYSTEM SETTINGS** screen will show:
   a. **HEAT SETTINGS — see page 77**
   b. **DHW SETTINGS — see page 80**
   c. **CIRCULATOR EXERCISING — see page 82**
   d. **FREEZE PROTECTION CIRCS — see page 82**

BOILER SETTINGS menus

Figure 85 BOILER SETTINGS menus (see Figure 86, page 76 for setting values and descriptions)



BOILER SETTINGS menus *(continued)*

BOILER MODEL

WARNING Check the **boiler model** against the model listed on the boiler's rating plate. Change the selection to the correct model if not. Also verify the model number on the WM97+ control display at power-up. Failure to correct could result in severe personal injury, death or substantial property damage.

HIGH ALTITUDE

WARNING If the boiler is installed at an altitude above 5,500 feet, select YES for high altitude. The WM97+ control will automatically adjust firing rates (blower speeds) to compensate for altitude.

HIGH LIMIT TEMPERATURE

NOTICE The boiler's high limit temperature during normal operation is fixed at 200°F and cannot be changed. The HIGH LIMIT TEMPERATURE setting in the WM97+ control menu is a temporary setting for test purposes ONLY.

1. If boiler outlet water temperature exceeds this temperature, the WM97+ control will shut down the boiler and enter lockout. Manual reset is required to restart the boiler.
2. The HIGH LIMIT TEMPERATURE setting will automatically return to 200°F if power is turned off. The boiler will restart when power is restored.
3. Use this control setting only to test the control's high limit function.

WWSD

1. WWSD stands for "warm weather shutdown." It means the boiler will not be allowed to fire if the outside temperature is greater than the WWSD setting.
2. When the boiler is kept off because the outside temperature is above WWSD, the graphic display will show "WWSD," and the boiler will remain in standby until the outside temperature drops below WWSD temperature.
3. WWSD does not apply to DHW systems.
4. The outdoor sensor must be installed to use this function. **The outdoor sensor must be installed unless specifically exempted in the Energy Act statement on page 133.**

ADJUST OUTDOOR

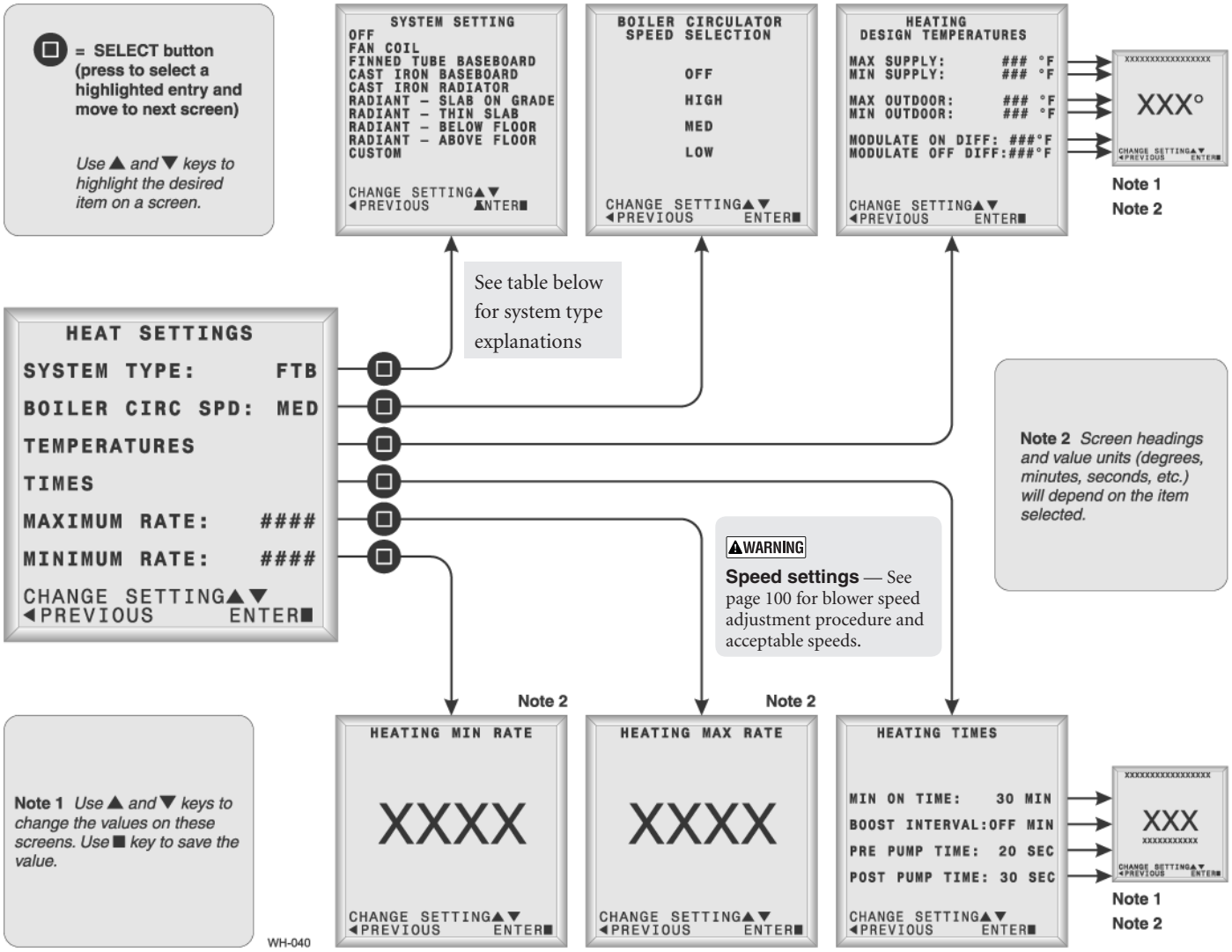
1. Use this setting to adjust the outdoor sensor temperature to account for solar or other effects, such as long lead wire, that would cause the sensor to read incorrectly.

Figure 86 BOILER SETTINGS menus (see Figure 84, page 74 for access information)

Menu/Item	Units	Low Value	High Value	Default	Comment
Boiler Model	70 110 155			factory	**WARNING** THIS MUST BE SET CORRECTLY FOR SAFE OPERATION. Adjusts blower speeds and flame sense (Display will show "HA" after the model number if high altitude has been selected, below.)
High Altitude	yes or no			no	Adjusts ignition and low fire fan speed (for altitudes above 5,500 feet only)
High Limit	°F	50	200	200	If boiler out temperature reaches this temperature, boiler will lockout, which requires a manual reset
WWSD Temp	°F	Off, 50	100	70	Boiler will not respond to heating calls above this outdoor temp
Adjust Outdoor	°F (difference)	-10	+10	0	This value plus outdoor sensor reading equals outdoor temp (Use this setting to compensate for solar gain or other factors that cause a shift in sensor temperature.)

HEAT SETTINGS menus

Figure 87 HEAT SETTINGS menus (see Figure 89, page 79 for setting values and descriptions)



System type	Display	Preset temperatures (see next page for description of settings)			
		MAX SUPPLY Temp	MIN OUTDOOR Temp	MIN SUPPLY Temp	MAX OUTDOOR Temp
Fan-coil	FCL	190	0	140	70
Finned tube baseboard	FTB	180	0	130	70
Cast iron baseboard	CIB	180	0	120	70
Cast iron radiators	CIR	180	0	120	70
Radiant – slab on grade	RSG	120	0	80	70
Radiant – thin slab	RTS	140	0	80	70
Radiant – below floor (staple up)	RFU	160	0	90	70
Radiant – above floor (sleeper system)	RAF	140	0	90	70
Custom	CUS	190	0	70	70

HEAT SETTINGS menus *(continued)*

HEAT SETTINGS

1. The heat settings menus are for setting control operation during space heating. The settings apply to all space heating zones. See Figure 89, page 79 for a listing of menu listings.
2. If DHW is used, the settings for control operation during DHW calls is set under the DHW SETTINGS menus (see Figure 90, page 80).

SYSTEM TYPE

1. Select the appropriate system type, based on the heating terminal units in the system. Use the CUSTOM selection to set the WM97+ control for a different system type.
2. The temperature presets are chosen based on normal best setting for the terminal units. The temperature values can be changed, if desired, under "TEMPERATURES."

BOILER CIRCULATOR SPEED

1. The boiler circulator speed can be chosen as needed for the flow requirements of the installation.

NOTICE **PRIMARY/SECONDARY operation** (boiler internal by-pass valve OPEN) — For most applications operating as primary/secondary, set the boiler circulator speed to LOW. If the temperature rise through the boiler is not acceptable at this flow, increase the speed to MED. Temperature rise should preferably be 30°F.

2. The LED on the circulator flashes based on speed (on constantly at high speed).

TEMPERATURES (HEATING DESIGN TEMPERATURES)

1. Set desired temperatures for space heating zones.
2. For an explanation of the target temperatures and associated outdoor temperatures, see Figure 88.

MAX SUPPLY

1. Set MAX SUPPLY to the required supply water temperature for the system at design maximum heat loss (typically 180°F for finned tube baseboard on new installations).

MIN SUPPLY

1. MIN SUPPLY should equal the desired minimum supply water temperature for the system.
2. The factory default is 130°F. This could be set as low as 70°F, which would supply "zero heat" when outdoor temperature is 70°F, because supply water temp would equal room temp.
3. See examples in Figure 88.

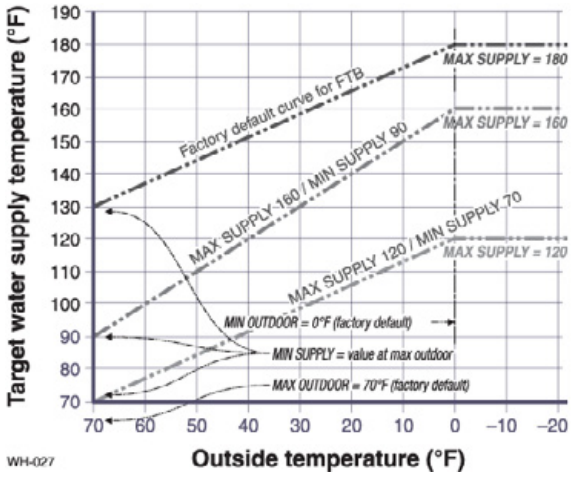
MAX OUTDOOR

1. MAX OUTDOOR means the outdoor temperature at which the target temperature reaches its minimum (MIN SUPPLY).
2. In the example of Figure 88, this occurs at 70 °F (the factory default).

MIN OUTDOOR

1. MIN OUTDOOR means the outdoor temperature at which the target temperature reaches its maximum value (MAX SUPPLY).

Figure 88 Typical outdoor reset curves



2. In the example of Figure 88, this occurs at 0°F outside (the factory default setting).
3. MIN OUTDOOR should equal the ODT (outdoor design temperature) for the installation's location.

MODULATE ON DIFF

1. The temperature must drop this many degrees below target temperature for the boiler to come on when a call for heat is present.

MODULATE OFF DIFF

1. While the boiler is firing, as the temperature increases above the target temperature, the boiler firing rate is reduced.
2. At this many degrees above the target temperature, the boiler shuts down.

TIMES (HEATING TIMES)

MIN ON TIME

1. This is the minimum time the boiler will satisfy the call for space heating before switching to DHW (if there is a DHW call).

BOOST INTERVAL

1. This applies when in outdoor reset mode (outdoor sensor installed — see page 133).
2. The boost timer starts on a call for heat. If the boost interval time passes and the call for heat is still on, the WM97+ control "boosts" the calculated target outlet water temperature by 10°F.
3. This occurs again if another boost interval elapses.

CONTINUED ON NEXT PAGE

HEAT SETTINGS menus *(continued)*

4. Boost will continue until the setpoint (target temperature) reaches the MAX SUPPLY setting.
5. The purpose of boost is to compensate for changes in demand not addressed by the reset curve. Typically, set boost to 30 minutes. The factory default is "OFF" — that is, boost is not enabled with default settings.

PRE PUMP TIME

1. The boiler circulator and zone circulators (if activated with the WM97+ zone circulator outputs) will start this amount of time before the burner is started.

POST PUMP TIME

1. The boiler circulator and zone circulators (if activated with the WM97+ zone circulator outputs) will continue this amount of time after the burner is shut down when the call for heat is satisfied.

MIN RATE / MAX RATE

1. Use to set minimum and maximum boiler inputs by setting minimum and maximum blower RPM.
2. This adjustment can be used to match the maximum boiler output the maximum heat load. This will reduce boiler cycling and increase boiler/system efficiency.

NOTICE **During combustion testing**, the Maximum rate must be set to the Maximum Rate "High Value" listed in Figure 89 to allow the boiler to be set to maximum input during high-fire set-up and testing.

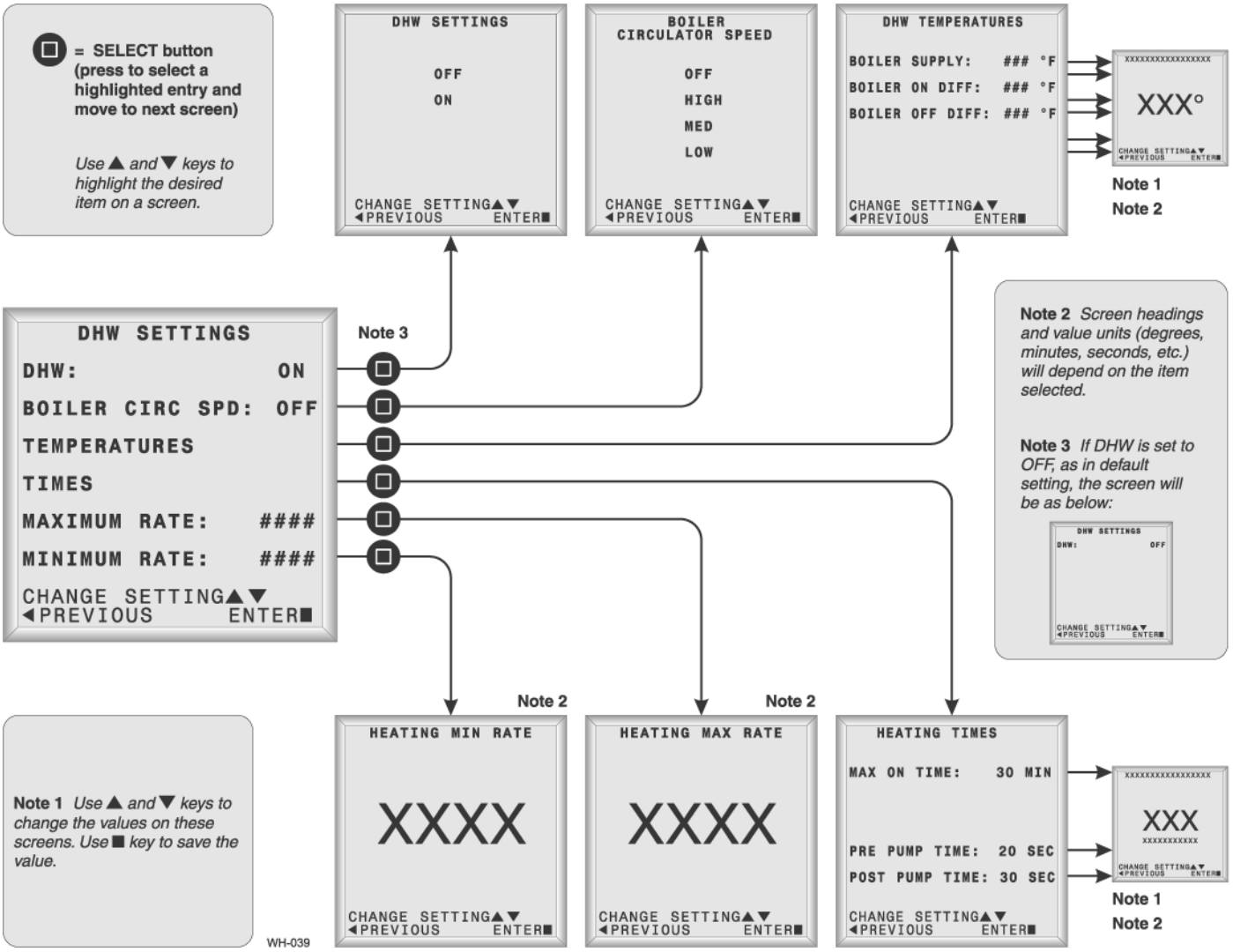
Figure 89 HEAT SETTINGS menus (see Figure 84, page 74 for access information)

Menu/Item	Units	Low Value	High Value	Default	Comment
System Type	Types	Off	Custom	FTB	
Boiler Circulator Spd	Selection	Off	High	Med	Select speed or select OFF to deactivate boiler during space heating call
Max Supply	°F	60	190	180	Boiler enters manual reset lockout at 200°F
Min Supply	°F	60	190	130	N/A - DHW does not use reset
Max Outdoor	°F	50	100	70	N/A - DHW does not use reset
Min Outdoor	°F	–20	50	0	N/A - DHW does not use reset
Modulate On Diff	°F	2	10	5	Boiler turns on if temperature drops below target minus differential on
Modulate Off Diff	°F	2	10	5	Boiler shuts down if modulates past target plus differential off
Min On Time	minutes	off	240	30	Shortest time boiler will satisfy space heating system before switching to DHW
Boost Interval	minutes	off	240	off	When operating on ODR increases target 10°F when this time expires until reaching MAX
Prepump Time: ### SEC	seconds	0	240	20	Additional time to run circulators longer than standard 10 second time
Postpump Time: ### SEC	seconds	off	240	30	Circulator run time after call for heat ends
Maximum Rate WM97+70 WM97+110 WM97+155	 RPM RPM RPM	 1100 1400 1300	 4300 5650 5500	 4150 5450 5300	Boiler Model and altitude specific (derated automatically if HIGH ALTITUDE is selected in control setup) NOTE: Adjusting boiler firing rate will affect AFUE rating.
Minimum Rate WM97+70 WM97+110 WM97+155	 RPM RPM RPM	 1100 1400 1300	 4300 5650 5500	 1100 1400 1300	Boiler Model and altitude specific (derated automatically if HIGH ALTITUDE is selected in control setup) NOTE: Adjusting boiler firing rate will affect AFUE rating.

DHW SETTINGS menus

CWH Installations — See Companion Water Heater manual for screen information. When the WM97+ control detects the combi temperature sensors, it automatically enables the CWH screens and CWH control operation.

Figure 90 **DHW SETTINGS** menus (see Figure 91, page 81 for setting values and descriptions)



DHW SETTINGS

1. The DHW SETTINGS menus are for setting control operation during DHW operation. The settings apply ONLY to Zone 1. (see Figure 90)
2. If DHW is used, the settings for control operation during DHW calls for heat are set under the DHW SETTINGS menus (see Figure 90, page 80).

DHW

1. Use this setting to enable or disable DHW operation of the WM97+ control.
2. The temperature presets are chosen based on normal best setting for DHW systems. The temperature values can be changed, if desired, under "TEMPERATURES."

BOILER CIRCULATOR SPEED

Direct-connected DHW (bottom connections)

1. The boiler circulator speed must be set to OFF for directly-connected DHW applications.
2. A separate DHW circulator must be supplied and wired to Circulator 1 output.

DHW as a zone in the system

1. Boiler circulator as system circulator — The boiler circulator should be set to HIGH for most applications on which the boiler circulators provides system flow.
2. Primary/secondary piping, zone valve-zoned or circulator zoned — Set the boiler circulator speed to LOW. Increase speed if needed.

CONTINUED ON NEXT PAGE

DHW SETTINGS menus *(continued)*

TEMPERATURES (DHW)

NOTICE **DHW priority** — The WM97+ control gives priority to DHW operation. During DHW call for heat, the space heating zone ouputs (Zone 2 and Zone 3) are disabled. This continues until the DHW call ends or the DHW MAX ON TIME has elapsed.

BOILER SUPPLY

1. The WM97+ control will regulate boiler firing to provide outlet water at this temperature.
2. For most DHW applications, set this to 190°F. A lower supply temperature can be used, but will reduce the indirect water heater heating capacity.

BOILER ON DIFF

1. The temperature must drop this many degrees below target temperature for the boiler to come on.

BOILER OFF DIFF

1. While the boiler is firing, as the temperature increases above the target temperature, the boiler firing rate is reduced.
2. At this many degrees above the target temperature, the control will temporarily turn off burner. The burner will be restarted when temperature drops below TARGET TEMPERATURE minus BOILER ON DIFF.

CWH Installations — See Companion Water Heater manual for control settings information.

TIMES (DHW TIMES)

MAX ON TIME

1. This is the longest time the boiler will continue in DHW mode before switching to space heating (if there is a space heating call).

⚠WARNING Setting MAX ON TIME to off will cause the control to never switch to space heating while DHW call for heat is present. This could present a freeze hazard for some installations if the DHW aquastat were to remain closed indefinitely.

PRE PUMP TIME

1. The boiler circulator (if enabled) and DHW circulator will start this amount of time before the burner is started.

POST PUMP TIME

1. The boiler circulator (if enabled) and DHW circulator will continue this amount of time after the burner is shut down when the call for heat is satisfied.

MIN RATE / MAX RATE

1. Use to set minimum and maximum boiler inputs by setting minimum and maximum blower RPM.

Figure 91 DHW SETTINGS menus (see Figure 84, page 74 for access information)

Menu/Item	Units	Low Value	High Value	Default	Comment
DHW:	Selection	Off	On	Off	This setting must be ON to operate in DHW mode
Boiler Supply	°F	60	190	190	Boiler enters manual reset lockout at 200°F
Boiler Circulator Spd	Selection	Off	High	Off	Select speed or select OFF to deactivate boiler during space heating call
Modulate On Diff	°F	2	10	5	Boiler turns on if temperature drops below target minus differential on
Modulate Off Diff	°F	2	10	5	Boiler shuts down if modulates past target plus differential off
Max On Time	minutes	off	240	30	Longest time boiler will satisfy this system before switching to DHW
Prepump Time: ### SEC	seconds	0	240	20	Additional time to run circulators longer than standard 10 second time
Postpump Time: ### SEC	seconds	off	240	30	Circulator run time after call for heat ends
Maximum Rate WM97+70 WM97+110 WM97+155	 RPM RPM RPM	 1100 1400 1300	 4300 5650 5500	 4150 5450 5300	Boiler Model and altitude specific (derated automatically if HIGH ALTITUDE is selected in control setup) NOTE: Adjusting boiler firing rate will affect AFUE rating.
Minimum Rate WM97+70 WM97+110 WM97+155	 RPM RPM RPM	 1100 1400 1300	 4300 5650 5500	 1100 1400 1300	Boiler Model and altitude specific (derated automatically if HIGH ALTITUDE is selected in control setup) NOTE: Adjusting boiler firing rate will affect AFUE rating.

CIRCULATOR EXERCISING and FREEZE PROTECTION CIRCULATORS menus

Figure 92 CIRCULATOR (SYSTEM SETTINGS) menu navigation (see Figure 84, page 74 for access information)

Menus	Next screen	Next screen	Next screen	DEFAULT
Follow information at the bottom of each screen to navigate to next/previous screen or enter/save data				
SYSTEM SETTINGS	CIRCULATOR EXERCISING	CIRCULATOR 1: ### CIRCULATOR 2: ### CIRCULATOR 3: ### BOILER CIRC: ###	ON/OFF ON/OFF ON/OFF ON/OFF	ON ON ON ON
	FREEZE PROTECT CIRCS	CIRCULATOR 1: ### CIRCULATOR 2: ### CIRCULATOR 3: ### BOILER CIRC: ###	ON/OFF ON/OFF ON/OFF ON/OFF	OFF OFF OFF ON

CIRCULATOR EXERCISING

1. For each circulator, select whether you want the WM97+ control to automatically start the circulator and run for 10 seconds for each 72-hour period of inactivity.

FREEZE PROTECTION CIRCULATORS

1. This function automatically fires the boiler at low fire and starts the circulators chosen if the heat exchanger sensor detects a temperature less than 40 °F. The circulators turn off when the temperature rises above 45 °F.

DIAGNOSTIC menu

Figure 93 DIAGNOSTICS menu navigation (see Figure 84, page 74 for access information)

Menus	Next screen	Next screen	Next screen	Next screen
Follow information at the bottom of each screen to navigate to next/previous screen or enter/save data				
DIAGNOSTICS	TEMPERATURES	STATUS: ########## BOILER OUT1: ###°F BOILER OUT2: ###°F BOILER IN: ###°F FLUE 1: ###°F FLUE 2: ###°F OUTDOOR: ###°F		
	INPUTS	STATUS: ########## INPUT 1: ### INPUT 2: ### INPUT 3: ### MANUAL LIMIT: ###### AUTO LIMIT: ###### LOW WTR CUTOFF: ###### BLOWER TACH: ####RPM FLAME SIGNAL: ###		
	OUTPUTS	STATUS: ########## GAS VALVE: ### BOILER CIRCULATOR: ### CIRCULATOR 1: ### CIRCULATOR 2: ### CIRCULATOR 3: ### BLOWER SIGNAL: ###% ALARM: ###		
	ERRORS	CONTROL FAULT ### IGNITION RETRIES ###		
		MANUAL RESET CNT ###		
		AUTO RESET CNT ###		
		LOCKOUT HISTORY 1	LOCKOUT HISTORY # HH:MM AM MM/DD/YY STATUS: ########## MANUAL RESET AUTO RESET INPUTS OUTPUTS TEMPERATURES	 LIST OF LOCKOUTS LIST OF LOCKOUTS INPUT STATUS OUTPUT STATUS TEMPERATURES
		LOCKOUT HISTORY 2 LOCKOUT HISTORY 3	. . . SAME AS HISTORY 1 . . . SAME AS HISTORY 1	
	SOFTWARE VERSIONS	DISPLAY W#.## MAIN MICRO W#.## SECOND MICRO W#.##		
	MANUAL TEST MODE	STATUS: ########## TARGET: ###°F MODULATION: ###°F BOILER OUT: ###°F BOILER IN: ###°F FLUE: ###°F OUTDOOR: ###°F BLOWER SIGNAL: ###% BLOWER TACH: ####RPM FORCE RATE AUTO		
	MANUAL RESET	PRESS ENTER TO RESET THE FOLLOWING ERROR (SCREEN SHOWS A LIST OF ERRORS)		

DIAGNOSTICS menu *(continued)*

Figure 94 DIAGNOSTICS menu details (see Figure 93, page 83 for access information)

Menu/Item	Units	Low Value	High Value	Default	Comment
TO RESET ALL HISTORY COUNTERS TO ZERO:	To reset all history counters to zero: Enter the DIAGNOSTICS menu. Then press and hold the left and right arrows located below the control display. Hold for 5 seconds. This will cause ALL history to be deleted. To maintain history, reset counters individually.				
Temperatures					
Status	Text			data	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shutdown, Trouble
Boiler Out1	°F			data	Temperature of the first sensing element of the boiler's heat exchanger outlet sensor
Boiler Out2	°F			data	Temperature of the second sensing element of the boiler's heat exchanger outlet sensor
Boiler In1	°F			data	Temperature of the boiler's heat exchanger inlet sensor
Flue1	°F			data	Temperature of the first sensing element of the boiler's flue gas sensor
Flue2	°F			data	Temperature of the second sensing element of the boiler's flue gas sensor
Outdoor	°F			data	Temperature of the remote outdoor air temperature sensor
CWH Tank Top	°F			data	Temperature at the top of the CHW tank
CWH Tank Bttm	°F			data	Temperature at the bottom of the CHW tank
Inputs					
Status	Text			data	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shutdown, Trouble
Input 1	on-off			data	Call for heat status on Zone 1 Input (DHW input if DHW active)
Input 2	on-off			data	Call for heat status on Zone 2 Input
Input 3	on-off			data	Call for heat status on Zone 3 Input
Manual Limit	open-closed			data	External manual limit on low voltage terminal strip
Auto Limit	open-closed			data	External auto limit on low voltage terminal strip
Low Wtr Cutoff	open-closed			data	Low water cutoff device (inside boiler jacket)
Blower Tach	rpm			data	Feedback from blower sensor
Flame Signal	no units			data	Number indicating the presence and quality of the flame used to shutdown boiler
Outputs					
Status	Text			data	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shutdown, Trouble
Gas Valve	on-off			data	Control's gas valve circuit status
Boiler circulator	volts			data	Control's variable voltage sent to control the boiler circulator speed — 0 V = OFF / 10 V = 100% = High speed
Circulator 1	on-off			data	Control's circulator 1 relay status
Circulator 2	on-off			data	Control's circulator 2 relay status
Circulator 3	on-off			data	Control's circulator 3 relay status
Blower Signal	% of rate			data	Control's signal controlling the blower speed
Alarm	on-off			data	Control's alarm contact status
Errors					
Control Fault	#			0	Displays number of control faults
Ignition Retries	#			0	Displays number of ignition attempts boiler is currently on
Manual Reset Cnt	#			0	Displays number of manual reset lockouts since last cleared
Auto Reset Cnt	#			0	Displays number of auto reset lockouts since last cleared
Lockout History 1					Choose this to view the most recent error recorded
Time & Date	text			data	Displays time and date that lockout occurred
Status	text			data	Displays what the status of the boiler at the time of the error
Manual Reset	yes or none			data	Choose this to view the details of manual reset lockouts
Auto Reset	yes or none			data	Choose this to view the details of auto reset lockouts
Inputs	menu			menu	Choose this to view the status of the Boiler Inputs at the time of the error
Outputs	menu			menu	Choose this to view the status of the Boiler Outputs at the time of the error
Temperatures	menu			menu	Choose this to view the Boiler Temperatures at the time of the error

DIAGNOSTICS menu *(continued)*

Figure 95 DIAGNOSTICS menu details (continued) (see Figure 93, page 83 for access information)

Menu/Item	Units	Low Value	High Value	Default	Comment
TO RESET ALL HISTORY COUNTERS TO ZERO:		To reset all history counters to zero: Enter the DIAGNOSTICS menu. Then press and hold the left and right arrows located below the control display. Hold for 5 seconds. This will cause ALL history to be deleted. To maintain history, reset counters individually.			
Lockout History 2					Choose this to view the second most recent error recorded
Time & Date	text			data	Displays time and date that lockout occurred
Status	text			data	Displays what the status of the boiler at the time of the error
Manual Reset	yes or none			data	Choose this to view the details of manual reset lockouts
Auto Reset	yes or none			data	Choose this to view the details of auto reset lockouts
Inputs	menu			menu	Choose this to view the status of the Boiler Inputs at the time of the error
Outputs	menu			menu	Choose this to view the status of the Boiler Outputs at the time of the error
Temperatures	menu			menu	Choose this to view the Boiler Temperatures at the time of the error
Lockout History 3					Choose this to view the third most recent error recorded
Time & Date	text			data	Displays time and date that lockout occurred
Status	text			data	Displays what the status of the boiler at the time of the error
Manual Reset	yes or none			data	Choose this to view the details of manual reset lockouts
Auto Reset	yes or none			data	Choose this to view the details of auto reset lockouts
Inputs	menu			menu	Choose this to view the status of the Boiler Inputs at the time of the error
Outputs	menu			menu	Choose this to view the status of the Boiler Outputs at the time of the error
Temperatures	menu			menu	Choose this to view the Boiler Temperatures at the time of the error
Software Versions					
Display	W#.##			data	Software version of the microprocessor on the display circuit board
Main Micro	W#.##			data	Software version of the main microprocessor on the control circuit board
Second Micro	W#.##			data	Software version of the second microprocessor on the control circuit board
Manual Test Mode					
Status	text			data	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shutdown, Trouble
Target	°F			data	Calculated target temperature based on outdoor temp or the max setpoint if no ODR
Modulation	°F			data	Temperature of the sensor the boiler is using to base its modulation
Boiler Out	°F			data	Temperature of the outlet sensor on the boiler heat exchanger
Boiler In	°F			data	Temperature of the inlet sensor on the boiler heat exchanger
Flue	°F			data	Temperature of flue gases
Outdoor	°F			data	Temperature of outdoor air
Blower Tach	rpm			data	Blower's feedback to the control
Force Rate		Low, Med, High, or Auto		Auto	Used to manually force a rate during a call for heat. Choose auto for normal operation.
Manual Reset					Reset selected condition

MAINTENANCE, DATE AND TIME menus

Figure 96 MAINTENANCE, DATE AND TIME menus — navigation (see Figure 84, page 74 for access information)

MAINTENANCE INFO	NAME PHONE MODEL CP# INSTALLED LAST DATE NEXT DATE INTERVAL SETTINGS RESET REMINDER	################ ###-###-#### WM97+ ### ########## MM/DD/YY MM/DD/YY DD/MM/YY ## MONTHS PRESS ENTER TO RESET		
SET DATE AND TIME	SET YR/MN/DAY/HR/MIN			

Figure 97 MAINTENANCE, DATE AND TIME menus — details (see Figure 96 for access information)

Maintenance Info					
Name	text			blank	Contractor name to appear in maintenance reminders and during lockouts
Phone	text			blank	Contractor phone number
Model	text			blank	Displays the boiler model selected in the boiler setup
CP Number	text			blank	Enter the CP# of the boiler
Installed	text			blank	Enter the date the boiler was installed
Last Date	text			data	Date automatically entered when Reset Reminder is chosen by contractor
Next Date	text			data	Date automatically calculated when Reset Reminder is selected by contractor
Interval Settings	months	6	24	12	Contractor selects maintenance reminder frequency based on service history
Reset Reminder	menu			menu	Contractor selects this to update Last maintenance Date and Next Date. Homeowner uses this to ignore the reminder and update only the Next Date.

Set Time and Date					
Year	text			2011	Set year (homeowner or contractor)
Month	text			1	Set month (homeowner or contractor)
Day	text			1	Set day (homeowner or contractor)
Hour	text			12	Set hour (homeowner or contractor)
Minute	text			0	Set minute (homeowner or contractor)

MAINTENANCE INFO

1. Use this section to enter contractor's information and to enter an automatic notice for maintenance (default is 12 months). Because this shows on the display, it is an automatic means of notifying the homeowner of need for scheduled maintenance by the technician. Update the screen reminder to reset for the next maintenance date.

Startup — fill the system

Clean system to remove sediment

1. You must thoroughly flush the system (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.

⚠WARNING If the system needs to be cleaned, use only Sentinel X400 cleaner, available from Weil-McLain. See Figure 123, page 119 for information. Follow instructions supplied with the X400 cleaner.

2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
3. Flush system until water runs clean and you are sure piping is free of sediment.

⚠WARNING Do not use petroleum-based cleaning or sealing compounds in boiler system. Damage to elastomer seals and gaskets in system could occur, resulting in substantial property damage.

Before filling the boiler and system with water, verify the following. Boiler corrosion can occur.

Failure to comply could result in boiler failure or unreliable operation.

Water chemistry

Water pH between 7.0 and 8.5

1. Maintain boiler water pH between 7.0 and 8.5. Check with litmus paper or have chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains

1. Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chloride concentration must be LESS THAN 200 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chloride levels are typically less than 5 ppm.
2. Do not use the boiler to directly heat swimming pool or spa water.
3. Do not fill boiler or operate with water containing chloride in excess of 200 ppm.

⚠WARNING Verify that the water chemistry meets the limitations and requirements of all other equipment in the system.

Antifreeze

1. Use only antifreeze listed by Weil-McLain as suitable for use with WM97+ Gas Boilers. See Figure 123, page 119 for information.
2. See Replacement parts at the end of this manual for Weil-McLain part numbers to obtain antifreeze through a Weil-McLain distributor.

Use the correct amount of antifreeze

1. Determine the freezing temperature needed (to protect against lowest likely temperature the system water will encounter).
2. Find the antifreeze concentration by volume needed for this temperature from the antifreeze manufacturer's data on the antifreeze container.
3. Add up the volume (gallons) of all system piping and components, including the expansion tank and boiler.
   a. Boiler water content is listed in Figure 137, page 133.
   b. Remember to include expansion tank water content.
4. Multiply this volume by the (percent) antifreeze needed to find the number of gallons of antifreeze to add.

Fill and test water system

1. Fill system only after ensuring the water meets the requirements of this manual.
2. Close manual and automatic air vents and boiler drain valve.
3. Fill to correct system pressure. Correct pressure will vary with each application.
   a. Typical cold water fill pressure for a residential system is 12 psi.
   b. Pressure will rise when boiler is turned on and system water temperature increases. Operating pressure must never exceed 25 PSIG.
4. At initial fill and during boiler startup and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

⚠WARNING Eliminate all system leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure.

Purge air from water system

1. Connect a hose to the purge valve (see purge/drain valves, item 11, in piping diagrams beginning on page 44). Route hose to an area where water can drain and be seen.
2. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
3. Close zone isolation valves.
4. Open quick-fill valve on cold water make-up line.
5. Open purge valve.
6. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves

Startup — fill the system *(continued)*

Freeze protection (if used)

⚠WARNING Follow these guidelines to prevent possibility of severe personal injury, death or substantial property damage:

Use only the products listed by Weil-McLain for use with this boiler. See page 119 for information.

Thoroughly flush any system that has used glycol before installing the new WM97+ boiler.

Review the material safety data sheets (MSDS) are available online. The MSDS contains information on potential hazards and first aid procedures for exposure or ingestion.

Check antifreeze inhibitor level at least annually. Glycol concentration and inhibitor levels may change over time. Add antifreeze to increase concentration if necessary. Add inhibitor as needed to bring to acceptable level, using inhibitor test kit to verify.

In addition to antifreeze and inhibitor, use and maintain minimum level of Sentinel X100 inhibitor as directed on this page.

If using freeze protection fluid with automatic fill, **install a water meter to monitor water make-up**. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

DO NOT exceed 50% antifreeze by volume. Antifreeze moves more sluggishly than water and can interfere with heat transfer. At antifreeze concentrations higher than 50%, sludge can develop in the boiler, potentially causing damage to the heat exchanger.

Clean the system before filling. Always drain and flush the system thoroughly before filling with antifreeze. Sludge, iron oxide deposits and other sediment in the system inhibit flow and can cause rapid breakdown of inhibitors.

Use only antifreeze recommended by Weil-McLain.

NOTICE Weil-McLain provides information for application of the antifreeze products listed in this document only for use in Weil-McLain WM97+ boilers. Do not apply these products or instructions for other applications. Local codes may require a backflow preventer or actual disconnection from city water supply.

and proceed with the next zone. Follow this procedure until all zones are purged. Follow the same procedure to purge air from the boiler and its internal piping.

7. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
8. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
9. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
10. Open automatic air vent (diaphragm-type or bladder-type expansion tank systems only) one turn.
11. Starting on the lowest floor, open air vents one at a time until water squirts out.
12. Repeat with remaining vents.
13. Refill to correct pressure.

Use X100 inhibitor supplied with boiler

1. The WM97+ boiler is shipped with Sentinel X100 inhibitor and Sentinel X100 Quick Test Kit. See Repair Parts at the end of this manual for re-ordering information.
2. After filling the system as directed in these instructions, use a caulking gun to inject the X100 inhibitor into the system, following the instructions on the tube.
3. Inject all of the inhibitor supplied with the boiler. Allow time for the water to circulate and mix. Then check the inhibitor level. Add additional inhibitor if necessary.

Check/verify water chemistry

1. The system may have residual substances that could affect water chemistry.
2. After the system has been filled and leak tested, verify water pH and chloride concentrations are acceptable.
3. Verify antifreeze concentration, if used.
4. Follow the instructions on the Sentinel test kit to sample the system water and verify inhibitor concentration.

Check inhibitor concentration annually

1. Test the pH of a sample of system water at least annually. The pH of the water mixture must be between 7.0 and 8.5. (Or use the Sentinel inhibitor test kit to check concentration.)
2. If pH is outside this range (or inhibitor test kit indicates low level), the inhibitor level may not be sufficient to prevent corrosion.
3. Test antifreeze concentration.

⚠WARNING Test antifreeze concentration at least annually. If concentration is low, add antifreeze or drain system and refill with correct mixture.

4. Follow instructions on antifreeze container to determine the amount of antifreeze needed. **DO NOT** exceed 50% by volume concentration of antifreeze.
5. Check inhibitor level after adjustments are made.

Startup — final checks

⚠WARNING Check for gas leaks

Before starting the boiler, and during initial operation, use a leak detector or smell near the floor and around the boiler for gas odorant or any unusual odor. Remove boiler front door and smell the interior of the boiler jacket. **Do not proceed with startup if there is any indication of a gas leak. Repair any leak at once**.

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

Propane boilers only — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

Check thermostat circuits

1. Disconnect wires connected to the Zone 1, Zone 2 and Zone 3 thermostat terminals (see Field wiring, beginning on page 66 for low voltage terminal locations and application information). Mark the wires before removing to avoid wiring errors when re-connecting them.
2. Connect a voltmeter across each pair of incoming wires. Close each thermostat, zone valve and relay in the external circuits one at a time and check the voltmeter reading across the incoming wires.
3. **There should NEVER be a voltage reading.**
4. If a voltage does occur under any condition, check and correct the external wiring.

⚠WARNING **DO NOT connect the WM97+ thermostat terminals to 3-wire zone valves.** This could cause WM97+ control damage.

5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires.

Inspect/fill condensate system

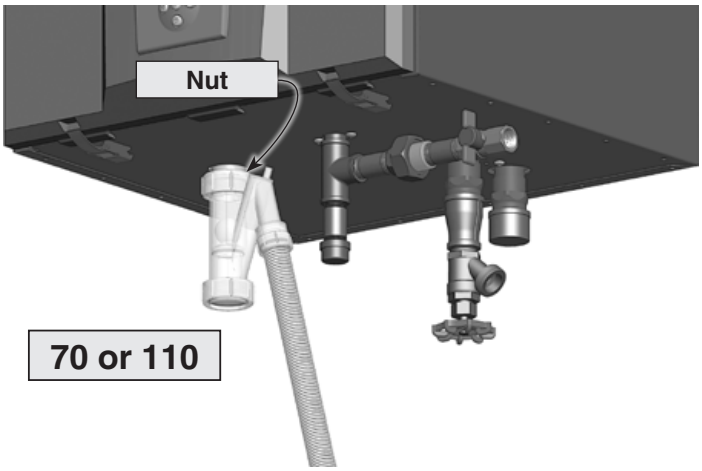
Inspect/check condensate lines and fittings

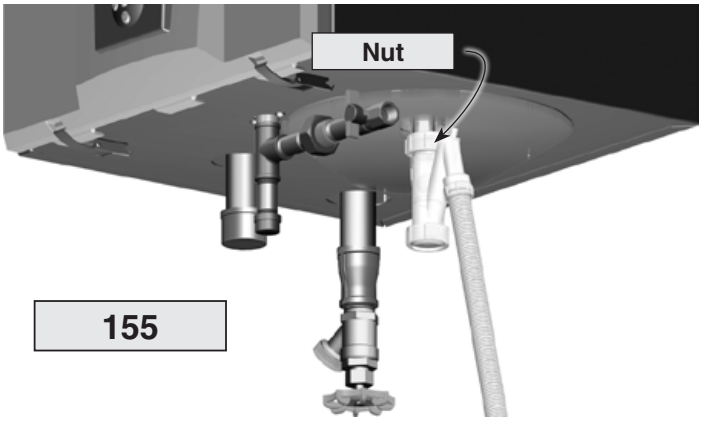
1. Inspect the condensate drain line, condensate PVC fittings and condensate trap. (See page 62 for component locations.)

Fill condensate trap with water

1. Loosen the top nut that secures the condensate trap body to the boiler condensate connection (see Figure 98). Pull the trap down to disengage from heat exchanger.

Figure 98 Disconnect condensate trap assembly to fill trap body with water





2. Pull the trap body forward enough to allow pouring water into the top of the trap.
3. Fill the trap with fresh water until water begins to run into the condensate drain tube.
4. Reattach the trap body by sliding onto the boiler condensate outlet, then retightening the trap body nut.

⚠WARNING The condensate trap must be filled with water during all times of boiler operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

Startup — final checks *(continued)*

Final checks before starting boiler

- ❑ Read the instructions to adjust and set up the WM97+ control.
- ❑ Verify that the boiler model is set correctly in the WM97+ control, and that it displays correctly.
- ❑ Verify that the boiler and system are full of water and all system components are correctly set for operation.
- ❑ Verify that condensate trap is filled with water.
- ❑ Verify electrical connections are correct and securely attached.
- ❑ Inspect vent piping and air piping for signs of deterioration from corrosion, physical damage or sagging. Verify air piping and vent piping are intact and correctly installed per this manual.

To start the boiler

1. Turn OFF the boiler ON/OFF switch.
2. Follow the Operating Instructions, Figure 99, page 91.
3. The WM97+ control display will show installed sensors when first powered. Make sure the right sensors are detected and the correct boiler model is identified. If not, determine the cause and correct before proceeding.

If boiler does not start correctly

1. Check for loose connections, blown fuse or service switch off?
2. Are external limit controls (if used) open? Is boiler water temperature above 200 °F?
3. Are thermostats set below room temperature?
4. Is gas turned on at meter and boiler?
5. Is incoming gas pressure less than the minimum values given on page 18?
6. Are WM97+ control settings correct for the application?
7. Is the warm weather shutdown activated?
8. If none of the above corrects the problem, refer to Troubleshooting, beginning on page 102.

❑ Check system and boiler

❑ Check water piping

1. Check system piping for leaks. If found, shut down boiler and repair immediately. (See WARNING on page 87 regarding failure to repair leaks.)
2. Vent any remaining air from system using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.

❑ Check vent piping and air piping

1. Check for gas-tight seal at every connection and seam of air piping and vent piping.

⚠WARNING Venting system must be sealed gas-tight to prevent flue gas spillage and carbon monoxide emissions which will result in severe personal injury or death.

❑ Check gas piping

1. Check around the boiler and inside the boiler jacket for gas odor following the procedure of page 63 of this manual.

⚠WARNING If you discover evidence of any gas leak, shut down the boiler at once. Find the leak source with bubble test and repair immediately. Do not start boiler again until corrected. Failure to comply could result in severe personal injury, death or substantial property damage.

❑ Propane boilers — verify conversion

1. Verify boiler has been converted for propane. See page 14 for WM97+70 or 110 or page 16 for WM97+155.

⚠WARNING **DO NOT attempt to measure gas valve outlet pressure**

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment.

Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

WM97+ boilers are shipped ready to fire natural gas ONLY.

Failure to comply could result in severe personal injury, death or substantial property damage.

❑ Check flame & combustion with instruments

1. Initiate a call for heat on one of the thermostat inputs.
2. Access the WM97+ control installer menus by pressing and holding the UP and DOWN arrow keys for seven seconds.
3. See Figure 89, page 79. Make sure the Max firing rate is set to the maximum given in the table. If not, adjust as necessary. Then navigate to DIAGNOSTICS — Manual test mode (see Figure 93, page 83) and force the firing rate to MAX (high fire).
4. Look at the flame through the flame inspection window. The high fire flame should be blue and should be stable. The burner surface should be covered with orange dots.
5. **Insert combustion analyzer probe** — Remove the flue temperature sensor from the flue pipe and insert a combustion test probe.
6. Test for CO_2 (or O_2) and for CO. The CO_2 values must comply with Figure 101, page 93. If results are acceptable, proceed to step 7. **IF NOT**, follow the instructions under "Throttle Screw Adjustment" on page 92 or page 93 to set the throttle screw position. See **WARNING** on page 92 upper left.

CONTINUED AFTER NEXT PAGE

Startup — final checks *(continued)*

Figure 99 Operating instructions (WARNING — Verify that the WM97+ control is set for the correct boiler model before proceeding.)

FOR YOUR SAFETY — READ BEFORE OPERATING

⚠WARNING **If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.**

A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. Before OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

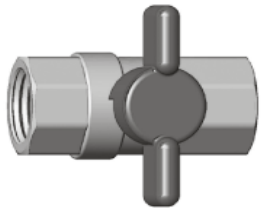
WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. Stop! Read the safety information above on this label. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. Set room thermostat(s) to lowest setting.
3. Turn OFF all electrical power to the appliance.
4. Locate boiler manual gas valve (in the gas piping below the boiler).
5. Turn boiler manual gas valve knob counterclockwise ↶ to OPEN gas supply.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor.
7. If you smell gas, STOP! Turn the boiler manual gas valve to OFF. Then follow WHAT TO DO IF YOU SMELL GAS, above. If you don't smell gas, go to step 8, below.
8. Turn ON all electrical power to the appliance.
9. Set thermostat(s) to desired setting.
10. The boiler display will show symbols and text describing the status of the boiler as it proceeds through its operating sequence. "Standby" status means there is no call for heat. A faucet or flame symbol on the display means the boiler is firing.
11. If the appliance will not operate when there is a call for heat and piping is not hot, follow the instructions "To Turn Off Gas To Appliance" below and call your service technician or gas supplier.
12. Make sure boiler manual gas valve is turned to CLOSED position.

Gas valve CLOSED



↶ to OPEN

Gas valve OPEN

↷ to CLOSE

TO TURN OFF GAS TO THE APPLIANCE

1. Set room thermostats to lowest setting.
2. Turn OFF all electrical power to the appliance.
3. Turn boiler manual gas valve knob clockwise ↷ to close gas supply.

550-101-258 (0811)

Startup — final checks *(continued)*

⚠WARNING If combustion at either high or low fire is outside the range given in Figure 101, follow the procedure given on page 92 or page 93 for adjusting the throttle screw on the venturi. If throttle screw adjustment does not correct the problem, then shut down the boiler and contact your local Weil-McLain representative. Throttle screw adjustment must be done only by a qualified technician, using calibrated test instruments. Failure to comply could result in severe personal injury, death or substantial property damage.

7. Measure natural gas input:
   a. Operate boiler 10 minutes. Turn off other appliances.
   b. At natural gas meter, measure time (in seconds) required to use one cubic foot of gas.
   c. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number of seconds from step b}} = \text{Btuh}$$

   d. Btuh calculated should approximate input rating on boiler rating label.
8. Use the WM97+ control display to navigate to Manual test mode (see Figure 93, page 83) and force the firing rate to MIN (low fire).
9. Look at the flame through the flame inspection window. The low fire flame should be stable and evenly distributed over burner surface with a uniform orange color.
10. Repeat the combustion test as instructed in the previous steps.
11. Use the WM97+ control display to navigate to Manual test mode (see Figure 93, page 83) and force the firing rate to AUTO (normal operation).
12. Reinstall the flue gas temperature sensor. When replacing the sensor, remove the rubber grommet from the probe. Insert the rubber grommet into the flue pipe, then insert the probe into the rubber grommet.

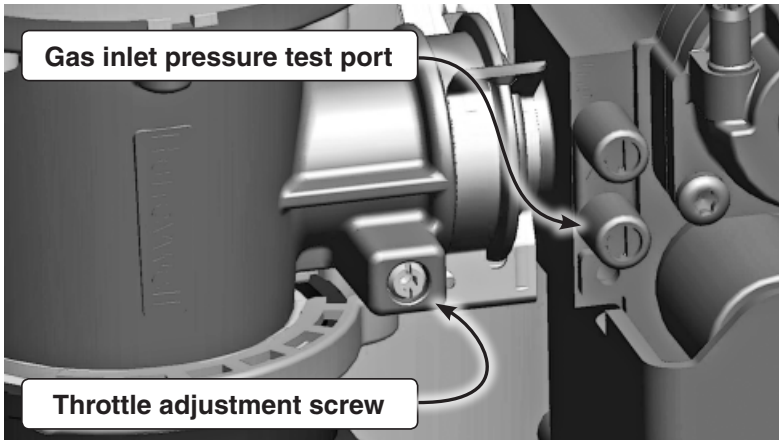
⚠WARNING You must reinstall the flue gas temperature sensor to prevent flue gas spillage into the boiler enclosure. Failure to comply could result in severe personal injury, death or substantial property damage.

Throttle screw adjustment
WM97+70 or 110 ONLY

⚠WARNING **DO NOT** attempt to adjust the throttle screw unless by a qualified technician, and with the use of calibrated combustion test instruments. Adjust the throttle screw only as needed to meet the combustion values given in Figure 101.

1. Throttle screw adjustment is **only necessary** if specified elsewhere in this manual or if combustion tests indicate the need, as explained under "❑ **Check flame & combustion with instruments**," page 90.
2. Boiler behavior that might indicate a need to check combustion values at high fire (as per page 90) to verify boiler is in adjustment include: difficulty igniting, poor flame stability at low fire, combustion noise or high carbon monoxide values.
3. Combustion readings must be taken at both high fire and low fire. DO NOT attempt an adjustment of the throttle screw at low fire. Just check the combustion values.
4. See Figure 100 for location of the **WM97+70 or 110** throttle screw. Remove the cover screw to access the throttle adjustment screw.

Figure 100 WM97+70/110 Throttle screw (ONLY for use by a qualified technician, using calibrated combustion test instruments)



⚠CAUTION Adjust the throttle screw in small movements. Turning the screw too far will cause the adjustment to reverse behavior.

5. See Figure 89, page 79. Make sure the Max firing rate is set to the maximum given in the table. If not, adjust as necessary. Then navigate to DIAGNOSTICS — Manual test mode (see Figure 93, page 83) and force the firing rate to MAX (high fire). After the boiler has had time to stabilize, take a CO_2 reading. If result is not acceptable, do the following:
   a. Turn the throttle screw either direction very slightly. Allow the boiler to stabilize and take another CO_2 reading. Note whether CO_2 increases or decreases.
   b. Turn the screw slightly in the direction needed to increase or decrease reading as needed. Allow the boiler to stabilize and take another reading. Continue until CO_2 is acceptable.
6. Lock the boiler into low fire. Check the combustion readings. If results are acceptable at low fire, verify high fire readings again. Restore firing rate to AUTO. DO NOT adjust throttle on low fire.
7. Consult your local Weil-McLain representative if acceptable results cannot be obtained for both high and low fire.

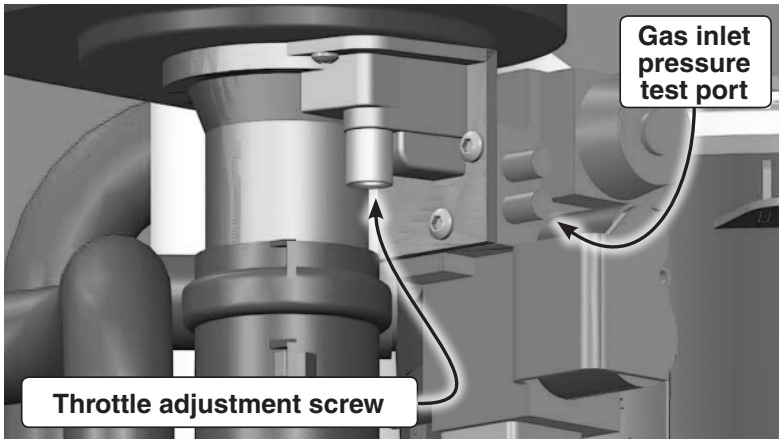
Startup — final checks *(continued)*

Throttle screw adjustment
WM97+155 ONLY

⚠WARNING **DO NOT** attempt to adjust the throttle screw unless by a qualified technician, and with the use of calibrated combustion test instruments. Adjust the throttle screw only as needed to meet the combustion values given in Figure 101.

1. Throttle screw adjustment is **only necessary** when specified elsewhere in this manual or when combustion tests indicate the need, as explained under "❑ **Check flame & combustion with instruments**," page 90.
2. Boiler behavior that might indicate a need to check combustion values at high fire (as per page 90) to verify boiler is in adjustment include: difficulty igniting, poor flame stability at low fire, combustion noise or high carbon monoxide values.
3. Combustion readings must be taken at both high fire and low fire. DO NOT attempt an adjustment of the throttle screw at low fire. Just check the combustion values.
4. See Figure 102 for location of the **WM97+155** throttle screw. Remove the cover screw to access the throttle adjustment screw.

Figure 102 WM97+155 Throttle screw (ONLY for use by a qualified technician, using calibrated combustion test instruments)



⚠CAUTION Adjust the throttle screw in small movements.

5. See Figure 89, page 79. Make sure the Max firing rate is set to the maximum given in the table. If not, adjust as necessary. Then navigate to DIAGNOSTICS — Manual test mode (see Figure 93, page 83) and force the firing rate to MAX (high fire). After the boiler has had time to stabilize, take a CO_2 reading.
   a. If the CO_2 is HIGH, turn the throttle screw CLOCKWISE to lower the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO_2 value is achieved.
   b. If the CO_2 is LOW, turn the throttle screw COUNTERCLOCKWISE to increase the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO_2 value is achieved.
6. Lock the boiler into low fire. Check the combustion readings. If results are acceptable at low fire, verify high fire readings again. Restore firing rate to AUTO. DO NOT adjust throttle on low fire.
7. Consult your local Weil-McLain representative if acceptable results cannot be obtained for both high and low fire.

Figure 101 Acceptable combustion values — measured values must be within the ranges given below

Boiler model	Fuel	High fire		Low fire	
		% CO_2	CO ppm	% CO_2	CO ppm
70	NG	9.25 +/– 1.0	< 150	9.25 +/– 1.0	< 50
	LP	10.0 +/– 0.5	< 150	10.0 +/– 0.5	< 50
110	NG	9.25 +/– 1.0	< 150	9.25 +/– 1.0	< 50
	LP	10.0 +/– 0.5	< 150	10.0 +/– 0.5	< 50
155	NG	9.25 +/– 1.0	< 150	8.75 +/– 1.0	< 50
	LP	10.25 +/– 0.5	< 150	9.75 +/– 0.5	< 50

- **Values above are with the boiler front door removed**. Values will increase about 0.2% once the door is reinstalled.
- **REINSTALL** the boiler door after completing service.
- Values above are for altitudes up to 5,500 feet. For higher altitudes, CO_2 may be slightly lower and CO slightly higher.

❑ Check exchanger and vent seals

1. Operate the boiler on HIGH fire.
2. Using an inspection mirror, move the mirror around all heat exchanger joints and vent pipe connections at the top of the boiler and at the connection to the condensate dish.
3. A leak would appear as vapor on the surface of the mirror.
4. If there is any indication of a leak at any joint, immediately shut down the boiler.
   a. If possible, tighten the retaining screws or nuts (without over-tightening).
   b. If this does not correct the problem, dissassemble the components where the leak appeared. Use the procedures given in the Maintenance section of this manual.
   c. When disassembling components, inspect gaskets to see if there is damage. Replace any damaged gasket.
   d. Contact your Weil-McLain representative if the problem cannot be addressed with the information provided in this manual.
5. Condensate dish joint
   a. If the inpsection mirror check shows a leak at the condensate dish-to-heat exchanger joint, contact your Weil-McLain representative for instructions to correct the problem.
   b. If the mirror test does not reveal a leak at the condensate dish joint, but there are signs of weepage or other indications that ther might be leakage, follow the procedure for checking the heat exchanger-to-condensate dish seal on page 111.

Check-out/startup verification

Adjust and test boiler controls

1. Follow instructions in this manual to set and verify operation of the boiler controls.
2. Follow low water cutoff manufacturers instructions.
3. If a Companion Water Heater is installed with the WM97+, verify that the mixing valve is installed and functional. Follow all instructions in the CWH manual.

Have the following been done?

❑ WM97+ control set for the correct boiler model?

❑ Installation date and installer contact information entered into WM97+ control?

❑ Boiler and heat distribution units filled with water?

❑ Water chemistry verified per page 87?

❑ Sentinel X100 corrosion inhibitor added and water tested to be within range?

❑ Automatic air vents, if used, opened one full turn?

❑ Air purged from system?

❑ Air purged from gas piping? Piping checked for leaks?

❑ Condensate trap primed?

❑ Propane orifice bushing installed for propane firing and propane conversion label affixed to jacket?

⚠WARNING WM97+ boilers are shipped ready to fire natural gas ONLY. To fire on propane, you must follow the instructions in this manual to install the propane orifice bushing. See page 14 for WM97+70 or 110 or page 16 for WM97+155. Failure to comply could result in severe personal injury, death or substantial property damage.

❑ Thermostat circuit wiring checked to ensure there are no stray voltages?

❑ Followed Operating Instructions, Figure 99, page 91?

❑ Burner flame and combustion verified per page 90?

❑ WM97+ control operation for space heating and DHW (if used) verified per this manual?

❑ Additional field-installed controls tested as outlined by control manufacturers? (Boiler should be operating and should go off when controls are tested. Verify controls cause automatic reset lockout or manual reset lockout as desired.)

❑ Additional field-installed limit control(s) set to system temperature requirements? Balancing valves and controls adjusted to provide design temperature to system?

❑ Flow adjusted/balanced for each zone of multiple zones systems?

❑ Thermostat heat anticipator (if available) set properly?

❑ Boiler cycled with thermostats (and with DHW aquastat, if installed) — Raised to highest setting and verified boiler goes through normal startup cycle? Lowered to lowest setting and verified boiler goes off?

❑ Natural gas input measured? (page 92)

❑ Incoming gas pressure checked by connecting manometer to gas valve ahead of boiler? (Gas pressure must be at least the minimum values given on page 18, with boiler operating at high fire, and no more than 13 inches (330 mm) w.c. with boiler operating or boiler off.)

❑ Observed several operating cycles for proper operation?

❑ Room thermostats set to desired room temperature (and DHW aquastat, if installed, to desired DHW storage temperature)?

❑ All instructions shipped with this boiler reviewed with owner or maintenance person?

Before leaving:

❑ Fill in **Installation certificate**, page 135.

❑ Fill out the warranty registration card and send to Weil-McLain.

❑ Return instructions to envelope and give to owner or place inside boiler housing.

NOTICE Fill out start-up data on the Installation and Service Certificate, page 135.

Part number 550-142-120/0113

Annual startup and general maintenance

⚠WARNING Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

Figure 103 Service and maintenance schedules

Service technician

(see page numbers indicated for details)

ANNUAL START-UP (See First-year special inspection)

- Address reported problems 95
- Inspect boiler area 95
- Inspect boiler interior & door gaskets 95
- Clean condensate trap 95
- Check all piping for leaks 95
- Check air openings 96
- Flue vent system and air piping 96
- Check water system 96
- Check expansion tank(s) 96
- Inspect ignition electrode 96
- Check ignition wiring 97
- Check all boiler wiring 97
- Check control settings 97
- Perform startup and checks 97
- Companion Water Heater installations only — verify operation per CWH manual 97
- Check low water cutoff service light 97
- Check burner flame 97
- Check flame signal 97
- Check blower speeds 98
- Check flue gas temperature 98
- Check boiler relief valve 99
- Reinstall jacket door after servicing 99
- Review with owner 99

Owner maintenance

(see WM97+ User's Information Manual)

Daily	• Check boiler area. • Check air openings. • Check pressure/ temperature gauge. • Verify boiler front door is securely in place.
Monthly	• Check vent piping. • Check air piping. • Check relief valve. • Check condensate drain system. • Check automatic air vents (if used). • Verify that domestic hot water is being supplied to fixtures at the correct temperature.
Every 6 months	• Check boiler piping (gas and water) • Operate relief valve.

Annual startup

HANDLING CERAMIC FIBER MATERIALS

REMOVING BURNER GASKET or COVER PLATE INSULATION

⚠WARNING The WM97+ cover plate refractory contain ceramic fiber material.

Ceramic fibers can be converted to cristobalite in very high temperature applications.

The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).":

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Handle carefully to minimize dust that could be caused by abrasion.
- If replacement is necessary, remove the refractory from the boiler and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid

- Eye: Irrigate immediately
- Breathing: Fresh air.

FIRST-YEAR SPECIAL INSPECTION

NOTICE **It is recommended that you obtain a Weil-McLain WM97+ Boiler Maintenance kit before attempting the first-year inspection, to ensure all parts that may be needed are available**. This kit includes a heat exchanger cover plate gasket, burner gasket, new ignitor, and ignitor gasket. See listing in Replacement parts section of this manual. These parts must be on hand when you perform the first-year inspection in the event they must be replaced.

⚠WARNING Failure to replace the items above when needed could result in severe personal injury, death or substantial property damage.

1. **No later than 12 months** after the boiler is installed, perform a first-year inspection of the boiler. This should include the following **in addition to routine annual start-up procedures**.
   a. Inspect the heat exchanger and clean if necessary (see page 112 (for WM97+70 or 110) or page 115 (for WM97+155) for access and cleaning procedures).
   b. Inspect the cover plate refractory and gasket. Replace if not in good condition.
   c. Inspect the burner and inspect carefully. Clean the burner thoroughly using a vacuum cleaner and compressed air if needed.
   d. Make sure there is no blockage or accumulation of debris in the burner or the burner ports. Replace the burner if necessary.
   e. WM97+70 or 110: Check the burner for tightness. Remove the cover plate refractory and tighten the burner mounting screws if needed, following the instructions on page 112.
   f. WM97+155: Check burner access cover for tightness.
   g. Make sure to follow the inspection procedure given in "Check exchanger and vent seals," page 93.
   h. Disconnect the condensate trap and drain lines. Inspect, then flush thoroughly. Reinstall and refill the trap per page 89.
2. Determine any follow-up maintenance and service needs based on the condition of the heat exchanger and condensate lines.
   a. If the heat exchanger shows substantial fouling, or if condensate lines show accumulation of sediment, schedule a follow-up service call to perform the first-year inspection again, sooner than the normal twelve months between.
   b. Heavy fouling of the exchanger or condensate lines indicates possible combustion air contamination. Inspect the air intake area carefully, and remove possible contaminants. See page 19, for products to avoid.

⚠WARNING You must eliminate causes of corrosion and contamination to ensure reliable operation of the boiler and system.

Annual startup *(continued)*

⚠WARNING The boiler should be inspected and started annually, at the beginning of the heating season, only by a qualified service technician. In addition, the maintenance and care of the boiler designated in Figure 103, page 95 and explained on the following pages must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.

⚠WARNING Electrical shock hazard — Turn off power to the boiler before any service operation on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

Address reported problems

1. Inspect any problems reported by owner and correct before proceeding.

Inspect boiler area

1. Verify that boiler area is free of any combustible materials, gasoline and other flammable vapors and liquids.
2. Verify that air intake area is free of any of the contaminants listed on page 19 of this manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, reinstall the air and vent lines per this manual.

Inspect boiler interior & door gaskets

1. Remove jacket front door and inspect interior of boiler.
2. Visually inspect the door gaskets. Make sure all are in good condition. Obtain replacements if any gasket is damaged.

⚠WARNING Door gaskets must be intact, and must provide a reliable seal. Replace any damaged gasket.

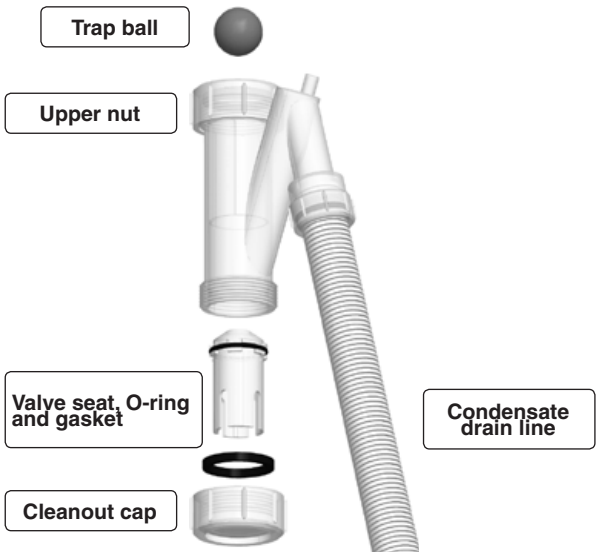
3. Remove the venturi air inlet silencer and clean if necessary. Reinstall silencer.
4. Vacuum any sediment from the inside of the boiler and components. Remove any obstructions.

⚠WARNING Do not use solvents to clean any of the boiler components. The components could be damaged, resulting in unreliable or unsafe operation.

Clean condensate trap

1. See Figure 104.
2. Disconnect top nut that secures the trap body to the boiler condensate connection (see Figure 71, page 62).
3. Remove the cleanout cap and remove the trap internal parts as shown.
4. Clean all trap components.
5. Re-assemble trap assembly. Re-install all lower gasket.
6. Make sure the trap ball moves freely when re-inserted.
7. Fill trap with fresh water by pouring into the top of the trap body. Continue filling slowly until water begins flowing out the condensate drain line. Make sure the trap line is unobstructed and flows freely.
8. Reattach the trap to the boiler condensate outlet. Push the trap up until fully engaged. Then twist the upper nut clockwise to tighten. Check for secure connection.

Figure 104 Condensate trap cleaning



Check all piping for leaks

⚠WARNING Eliminate all system or boiler leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines in the system and in the boiler and correct any problems found.
3. Check gas line using procedure on page 63.

Annual startup *(continued)*

Check air openings

1. Verify that combustion and ventilation air openings to the boiler room and/or building are open and unobstructed.
2. Check operation and wiring of automatic combustion air dampers, if used.
3. Verify that boiler vent discharge and air intake are clean and free of obstructions.

Flue vent system and air piping

1. Visually inspect entire flue gas venting system and combustion air piping for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions. Verify that air inlet piping is connected and properly sealed.

⚠WARNING Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Check water system

1. Verify all system components are correctly installed and operational.
2. Check the cold fill pressure for the system. Verify it is correct (usually around 12 PSIG).
3. Watch the system pressure as the boiler heats up (during testing) to ensure pressure doesn't rise too high. Excessive pressure rise indicates expansion tank sizing or performance problem.
4. Inspect automatic air vents and air separators. Remove air vent caps and briefly press push valve to flush vent. Reinstall caps. Make sure vents do not leak. Replace any leaking vents.
5. Check system water chemistry (pH, hardness and inhibitor level). See page 87.

Check expansion tank(s)

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools.
2. WM97+155 only — See page 43 for information.
3. WM97+70 and 110 only — The boiler is fitted with an integral diaphragm-type tank (12 liters, 3.2 gallons). The tank is factory charged to 12 PSIG.
   a. Supplementary expansion tanks, if used, may be closed or diaphragm or bladder type. See page 42 of this manual for suggested location of supplementary expansion tanks and air eliminators.
4. Tank types
   - Closed-type — welded gas tight and located above boiler. Tank is partially filled with water, leaving an air cushion for expansion.
     - Make sure a closed-type tank is fitted with a tank fitting, such as the B & G Tank-Trol or Taco Taco-Trol. This fitting reduces gravity circulation of air-saturated tank water back to the system and prevents the air from bubbling up through the water as it returns from the system.
     - Do not use automatic air vents in systems with closed-type tanks. The air will escape from the system instead of returning to the tank.
     - Eventually, the tank will waterlog and no longer control pressurization. The boiler relief valve will weep frequently.
   - **Diaphragm- or bladder-type** — welded gas tight with a rubber membrane to separate the tank pressurizing air and the water. May be located at any point in the system, but preferably located on the suction side of the system circulator.
     - Systems with this type of expansion tank require at least one automatic air vent, preferably located on top of an air eliminator, as shown in examples in this manual.
5. If relief valve has tended to weep frequently, the expansion tank may be waterlogged or undersized.
   a. WM97+70 or 110 only — If system volume is greater than 15 gallons, a supplementary expansion tank may be needed (see page 42). Check the following.
      - **Integral expansion tank in boiler** — Check the tank charge pressure by closing the expansion tank isolation valve. Allow the tank to cool off. Isolate the tank by disconnecting from the boiler internal piping. Then check the charge pressure in the tank. It should be 12 PSIG. If necessary, adjust tank pressure.

⚠WARNING **Relieve pressure from the system before isolating the 70/100 internal expansion tank. If removing the tank for service or replacement, the tank may contain some water, which could be hot.**

   b. **Diaphragm- or bladder-type expansion tank** — first, check tank size to be sure it is large enough for the system. If size is too small, add additional tank (or tanks) as necessary to provide sufficient expansion. If tank size is large enough, remove tank from system and check charge pressure (usually 12 PSIG for residential applications). If tank won't hold pressure, membrane has been damaged. Replace tank.
   c. **Closed-type expansion tank** — tank is most likely waterlogged. Install a tank fitting if not already installed. Then check fill level per fitting manufacturer's instructions. If fill level is correct, check tank size against manufacturer's instructions. Replace with a larger tank if necessary.

Inspect ignition electrode

1. Remove the ignition electrode from the boiler heat exchanger access cover (see item 26, page 3 or page 5). (Disconnect the ground wire and ignition cable connected to the electrode.)
2. Remove any white oxides accumulated on the ignition electrode using steel wool. If the ignition electrode cannot be cleaned satisfactorily, replace ignitor with a new one.
3. Reinstall ignition electrode, making sure gasket is in good condition and correctly positioned.

⚠WARNING **TORQUE LIMIT** — Use a torque wrench when tightening the two ignition electrode retainer screws. DO NOT exceed 20 inch-pounds.

4. Re-attach the ground wire to the electrode assembly.

Annual startup *(continued)*

Check ignition wiring

1. Check ignition cable electrical resistance. A good cable will have resistance between 950 and 1050 ohms. Replace if not acceptable.
2. Inspect boiler ground wire from heat exchanger access cover to ground terminal screw.
3. Verify all wiring is in good condition and securely attached.
4. Check ground continuity of wiring using continuity meter.
5. Replace ground wires if results are not satisfactory.

Check all boiler wiring

1. Inspect all boiler wiring, making sure wires are in good condition and securely attached.
2. Verify that all connectors are securely inserted.

Check control settings

1. Use the WM97+ control display to navigate through all settings. Adjust settings if necessary.
2. Check settings of external limit controls (if any) and adjust if necessary. Adjust as needed to accommodate the system design.

Perform startup and checks

1. Start boiler and perform checks and tests specified in this manual.
2. Verify cold fill pressure is correct and that operating pressure does not go too high. Adjust water pressure and expansion tank charge pressure as necessary.
3. Complete the check-out procedure on page 94.

CWH installations only — verify operation per CWH manual

1. If a Companion Water Heater (CWH) is installed, follow instructions in the CWH manual to set and verify operation of the water heater.

Check low water cutoff service light

1. If the low water cutoff amber LED is on, the control requires service. Follow the low water cutoff manufacturer's instructions (shipped with the boiler in the literature envelope).

Check burner flame

⚠WARNING The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 96 of this manual. Failure to comply could result in severe personal injury.

1. Inspect flame through observation window using the procedure on page 90.
2. If flame is unsatisfactory at either high fire or low fire, check combustion values. If combustion is properly adjusted, turn off boiler and allow boiler to cool down. Then remove burner and clean it thoroughly using a vacuum cleaner or compressed air. Do not use compressed air to clean burner if performed inside a building.
3. To access the burner, remove the heat exchanger cover plate following the procedure beginning on page 112.
4. If replacing the burner, ensure the burner gasket is in good condition and correctly positioned. Follow all instructions on page 112 to reinstall all components.
5. Restart the boiler.
6. Inspect the flame at high and low fire. If flame is still not acceptable, check combustion values. If combustion is properly adjusted, obtain a replacement burner from Weil-McLain.

Check flame signal

1. Navigate to Diagnostics/Inputs on the WM97+ control display (see Figure 84, page 74 for navigation instructions and Figure 93, page 83 for the complete Diagnostics menus).
2. The flame signal value must be at least 75 for a WM97+70 or 110, or at least 160 for the WM97+155. If the flame signal drops below this level, the WM97+ control will attempt to correct by increasing the boiler firing rate to increase flame signal.

Figure 105 Flame signal shutdown values

Model WM97+	Shutdown flame signal	Model WM97+	Shutdown flame signal
70	50	155	150
70 HA	50	155HA	150
110	50	NOTE: "HA" means high altitude, 5500 feet or more above seal level.	
110 HA	50		

3. A low flame signal may indicate a fouled ignitor or damaged ignitor insulation.
   a. See "Inspect ignition electrode," page 98 to remove and inspect the ignitor.
   b. If required, clean the igniter as instructed.
   c. If cleaning the ignitor does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the ignitor.
4. If flame signal still remains low:
   a. Inspect the vent and air piping.
   b. Check combustion values.
   c. Then inspect the heat exchanger, following the procedures given in this manual for removal and reinstallation of the head exchanger cover plate and other boiler components (see page 112).
   d. Clean the exchanger as described in this manual if necessary.

Annual startup *(continued)*

Check blower speeds

1. For installations at altitudes above 5,500 feet, make sure the control is set up for high altitude in the boiler setup menu. The WM97+ control automatically adjusts low fire and ignition rates to compensate for high altitude conditions.
2. For installations below 5,500 feet, high altitude should NOT be enabled.
3. Use the WM97+ control display to navigate to DIAGNOSTICS/Manual test mode (see Figure 84, page 74 for navigation instructions and Figure 93, page 83 for the complete Diagnostics menus).
4. Set the firing rate to MINIMUM (low fire).
5. Write down the blower RPM value shown and compare to the value in Figure 106. The value should no less than the "Minimum setting" and no higher than the Ignition "Factory setting" listed. Low fire rate (and corresponding blower speed) is adjusted in the boiler setup menu.
6. Set the firing rate to MEDIUM (ignition rate).
7. Write down the blower RPM value. It should be within 200 RPM of the value listed in Figure 106.
8. Set the firing rate to MAXIMUM (high fire).
9. Write down the blower RPM value. It should be within 200 RPM of the value given in Figure 106.
10. If any of the values are outside the ranges listed in the previous steps, contact the factory for technical assistance.

NOTICE Minimum and maximum blower speeds can be adjusted within limits, but changing speeds will affect AFUE ratings.

Check flue gas temperature

1. Set the boiler to high fire. Then adjust the WM97+ control display to view flue gas temperature and boiler return temperature.
2. The flue gas temperature should be no more than 50°F higher than the boiler return temperature.
3. If the flue temperature is higher than this, shut down the boiler, allow to cool, and follow the procedure starting on page 112 to clean the heat exchanger.

Figure 106 Firing rates and corresponding blower speeds (low fire, ignition, and high fire) — for altitudes up to 5,500 feet and high altitude (above 5,500 feet)

WM97+ Model	70			110			155		
	%	RPM	Btu/Hr Note 1	%	RPM	Btu/Hr Note 1	%	RPM	Btu/Hr Note 1
Low fire									
Minimum setting	20	1,100	14,000	20	1,400	22,000	18	1,300	28,000
Factory setting	20	1,100	14,000	20	1,400	22,000	18	1,300	28,000
High altitude	33	1,675	23,000	33	2,150	37,000	33	2,100	52,000
Ignition ("Medium" setting in manual test mode)									
Factory setting	47	3,200	32,900	47	2,800	51,700	47	2,800	72,850
High altitude	62	3,500	43,400	62	3,500	68,200	61	3,500	94,550
High fire *(adjust if desired to match maximum system load — High fire % rate = Max heat load / Boiler output) (adjusting speed will affect boiler AFUE rating)*									
Factory setting	96	4,150	67,200	96	5,450	105,600	96	5,300	148,800
Maximum setting	100	4,300	70,000	100	5,650	110,000	100	5,500	155,000

Note 1 — The boiler will automatically derate the Btu values listed in this table by 4% per 1,000 feet above sea level.

Annual startup *(continued)*

Check boiler relief valve

1. Inspect the relief valve and lift the lever to verify flow as in the following warnings, excerpted from a relief valve manufacturer's warning label. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential.
2. Read page 39 before proceeding further.
3. Follow instructions below or perform procedures per relief valve manufacturer's printend instructions.

⚠WARNING Safety relief valves should be reinspected AT LEAST ONCE EVERY THREE YEARS, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency — not by the owner. Failure to reinspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death or substantial property damage.

⚠WARNING Following installation, the valve lever must be operated AT LEAST ONCE A YEAR to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal. Otherwise severe personal injury or property damage may result. If no water flows, valve is inoperative. Shut down boiler until a new relief valve has been installed.

4. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or under-sizing.

Reinstall jacket door after servicing

⚠WARNING

Reinstall boiler jacket front door after start-up or servicing. The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Inspect boiler jacket door gaskets. Gaskets must be in good condition, with no tears or gaps. Replace if necessary.

Failure to keep the door securely sealed and fastened could result in severe personal injury or death.

Review with owner

1. Review the User's Information Manual with the owner.
2. Emphasize the need to perform the maintenance schedule specified in the User's Information Manual (and in this manual as well).
3. Remind the owner of the need to call a licensed contractor should the boiler or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual startup at the beginning of the next heating season.

Troubleshooting

VERIFY PROPER OPERATION AFTER SERVICING

Before calling for troubleshooting assistance, fill in the "**WM97+ Gas Data Collection Sheet**" (page 136). Record the boiler size and CP number (located on the inside left side of the jacket above the heat exchanger).

⚠WARNING **Failure to adhere to these guidelines can result in severe personal injury, death or substantial property damage.**

ELECTRICAL SHOCK HAZARD

The boiler ON/OFF switch does not turn off all power to the boiler. **TURN OFF ALL POWER TO THE BOILER WHEN SERVICING**. Internal wiring is still powered when the switch is off.

DO NOT JUMPER DEVICES

Never jumper (bypass) any device except for momentary testing.

REINSTALL JACKET DOOR

The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the door securely fastened could result in severe personal injury or death.

BEFORE SERVICING or MAKING CONNECTIONS —

ALWAYS TURN POWER OFF TO THE BOILER TO PREVENT ELECTRICAL SURGES, WHICH CAN DAMAGE BOILER COMPONENTS.

LABEL WIRES BEFORE REMOVING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

BEFORE TROUBLESHOOTING —

1. See Figure 107 for tools and kits recommended for troubleshooting WM97+ boilers.
2. Check for 120 VAC (minimum 102 VAC to maximum 132 VAC) to boiler.
3. Check the WM97+ control's last three lockout histories. (Navigate to the DIAGNOSTICS menus.)
   a. See see Figure 84, page 74 for navigation instructions and Figure 93, page 83 for the complete Diagnostics menus.
   b. In the DIAGNOSTICS menu, scroll down to ERRORS and press the enter key.
   c. Record the first four data records and then highlight the history record you want to view.
   d. Follow information at the bottom of the screen to navigate through your lockout histories.

Figure 107 Tools and kits needed for troubleshooting

Tool	Purpose
#2 Phillips screwdriver	Multiple uses
10 mm wrench	Remove heat exchanger cover plate
#20 long-handled Torx driver	Remove burner screws
Multimeter	Measurements on sensors and electrical components
Manometer (Inclined or digital)	Measure the INLET gas pressure to the boiler
Combustion analyzer (Digital preferred)	Combustion testing and boiler adjustments
Contact thermometer	Checking surface temperatures of heat exchanger and pipes
Maintenance kit	ALWAYS have this kit on hand when performing maintenance in case replacement is required.

Check the following:

1. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24 VAC between thermostat wire nuts and ground.
2. Make sure all external limit controls are either installed (and closed) or temporarily jumpered for testing.
3. Make sure that connectors to WM97+ control are securely plugged in at module and originating control.
4. Gas pressures:
   - Maximum: 13" (330 mm) w.c. with no flow (gas valve lockup pressure).
   - Minimum: must be no less than the minimum values given on page 18 while operating on high fire.

Troubleshooting *(continued)*

Check WM97+ control fuses

⚠WARNING ALWAYS check WM97+ control fuses before replacing WM97+ control or any major components (blower, etc.). If one of these fuses is blown, it can prevent WM97+ control or other components from operating.

1. Turn OFF power to boiler at external line switch. Then remove the jacket door.
2. Access the WM97+ control fuses.
   a. See Figure 109. Rotate item 1, the inlet air silencer, about 45 degrees so it will be out of the way.
   b. Remove the two screws, item 4.
   c. Note the three slots (1, 2 and 3) on either side of the jacket. Lift the control housing (item 2) until the top support arms are aligned with slot 2, as shown. Pull the top of the housing forward so the upper arms swing free. Continue rotating the control housing until it rests on the jacket lower flange as in Figure 110.
   d. Disconnect the ignition wire (at item 7). Remove the control housing back cover (item 6) by pressing the retainer clips (item 5), then lifting and pulling cover forward.
3. Remove and inspect the two fuses (items 8 and 9, Figure 111).
4. If necessary, replace one or both of the fuses:
   a. Low voltage circuit fuse is 3-amp fast-blow (Littelfuse 326012P).
   b. Line voltage circuit fuse is 12-amp slow-blow (Littelfuse 257003).

⚠WARNING Do not jumper either fuse or replace with any fuse except as specified. Failure to comply could result in severe personal injury, death or substantial property damage.

5. Reinstall control housing cover and return control housing to normal position. Replace screws (item 4) and reconnect ignition cable at item 7.

Checking temperature sensors

1. The boiler temperature sensors (flue, outdoor, return water and supply water) are all resistance-type devices. Figure 108 shows the correct value for the sensor at various temperatures. For dual sensors, the temperature difference between the sensors must be no more than 10 °F.
2. Use the resistance values at 32°F, 60°F, 70°F and 212°F to measure the sensor resistance at known temperatures (ice point, room temperature and sea level boiling point). For ice point and boiling point, insert the sensor in water at that temperature. Use an ohmmeter to read resistance value.
3. To check whether the WM97+ control is correctly sensing temperature, you can use a resistance decade box. Connect the decade box temporarily in place of a sensor and read the corresponding temperature on the WM97+ control display. The temperature should be close to the value corresponding to the input resistance.

Figure 108 Sensor resistance values

Temp (°F)	Sensor ohms		Temp (°F)	Sensor ohms		Temp (°F)	Sensor ohms	
	Min	Max		Min	Max		Min	Max
32	34265	37871	**90**	8504	9399	**150**	2517	2782
40	27834	30764	**100**	6847	7568	**160**	2091	2311
50	21630	23907	**110**	5545	6129	**170**	1744	1928
60	16944	18727	**120**	4517	4992	**180**	1461	1615
70	13372	14780	**130**	3698	4088	**190**	1229	1359
80	10629	11747	**140**	3043	3364	**200**	1038	1147

Figure 109 Control housing lifted to slot 2 (jacket door removed and inlet air silencer rotated out of the way) (WM97+70 shown)

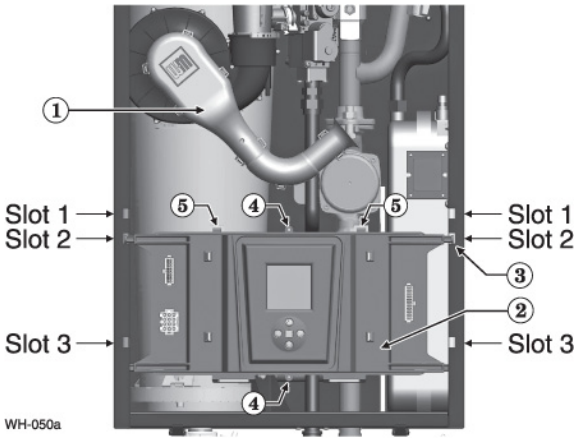


Figure 110 Control housing rotated forward (WM97+70 shown)

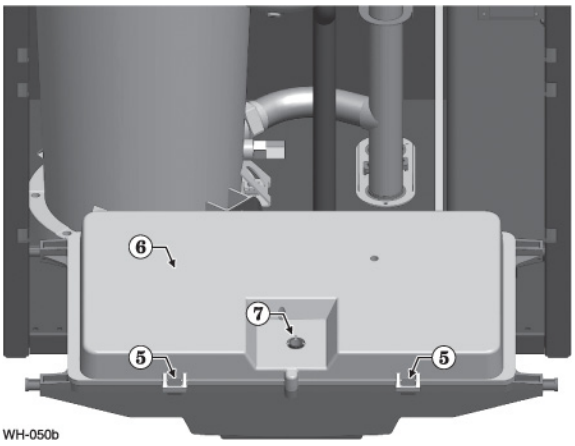
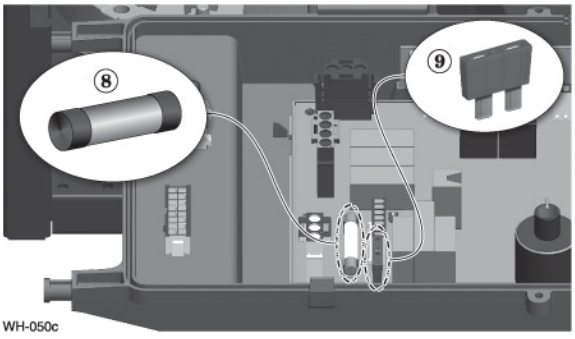


Figure 111 Control housing with back removed — close-up of WM97+ control fuse location on the control board



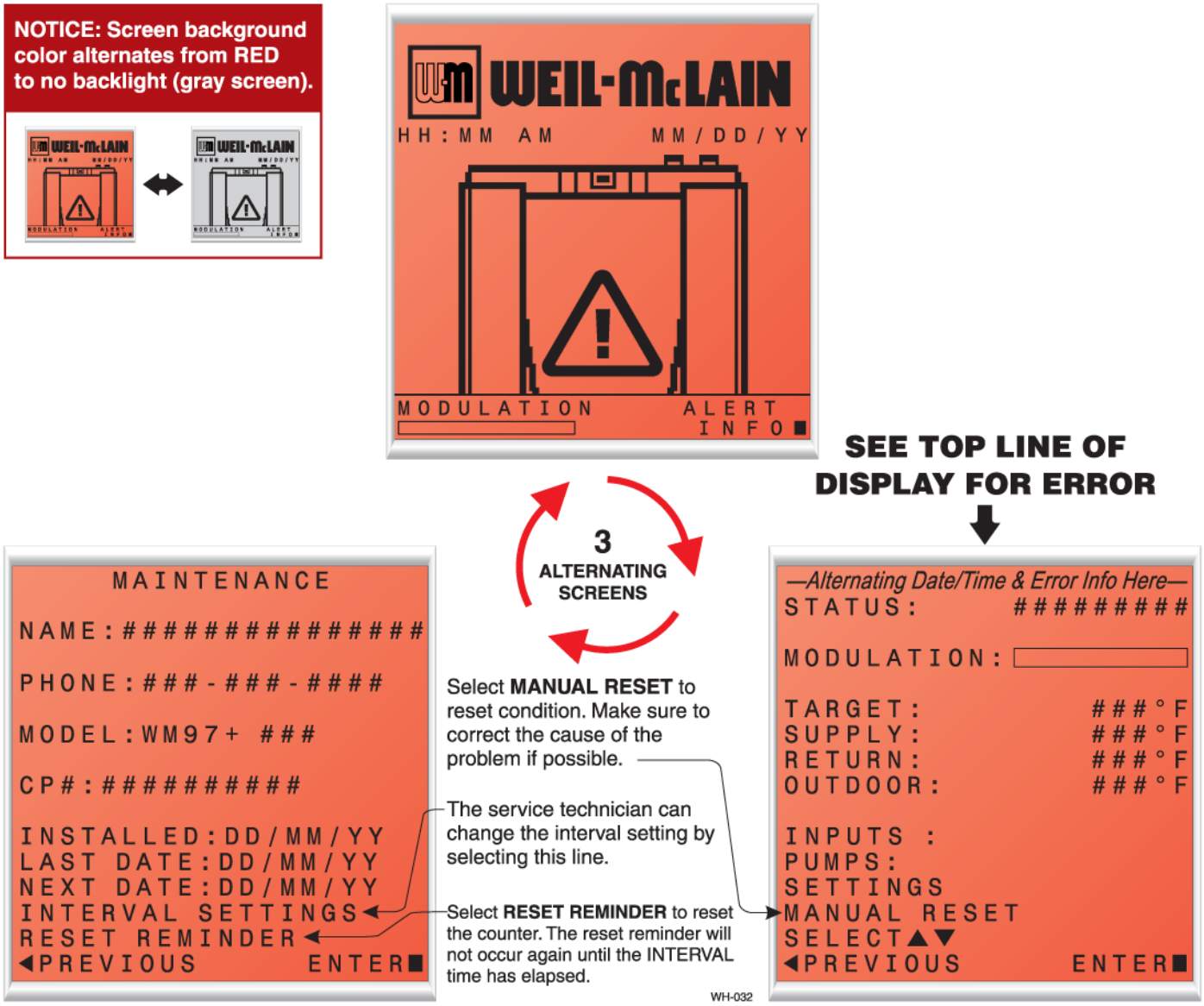
Troubleshooting *(continued)*

WARNING **Make sure to determine the causes of outages. Do not leave the boiler operating without a complete diagnosis.**

WM97+ control fault indications

1. The WM97+ control provides diagnostic information for both automatic reset conditions and manual reset conditions. See Figure 84, page 74 for information available on the WM97+ control display and navigation instructions for all menus.
2. Figure 112 shows the screen behavior during an automatic or manual reset condition. The table below the display illustration lists manual reset conditions and how to reset from them.
3. Figure 113, page 105 lists conditions that will cause the control to display a constant red screen. The boiler will automatically restart if the condition self-corrects or the technician uses the WM97+ control's manual reset screens to reset.

Figure 112 WM97+ control display toggles when in lockout, with screen flashing red to gray



Troubleshooting *(continued)*

Figure 113 Troubleshooting suggestions for WM97+ boilers — **WM97+ control Error Condition Log**

The WM97+ control is able to record information about the boiler's condition at the time of the three previous faults or errors. This information is available to view in Contractor Menus under "DIAGNOSTICS" by selecting "ERRORS." The control will display the following information:

Information	Description	Action
Control Fault	Records the number of internal control faults	Select and press the enter key to reset this count
Ignition Retries	Displays the number of ignition attempts in the current ignition sequence.	
Manual Reset Count	Records number of lockouts that required a manual reset since this count was last cleared.	Select and press the enter key to reset this count
Auto Reset Count	Records number of lockouts that have automatically reset since this count was last cleared.	Select and press the enter key to reset this count
Lockout History 1	Details of present or last recorded lockout	Select and press the enter key for more details
Lockout History 2	Details of boiler during the second oldest lockout still in memory	Select and press the enter key for more details
Lockout History 3	Details of boiler during the oldest lockout still in memory	Select and press the enter key for more details

How to read the last 3 lockout histories:

1. Scroll down to "DIAGNOSTICS" and press the enter key (Square Key in center)
2. Scroll down to "ERRORS" and press the enter key (Square Key in center)
3. Scroll down to "LOCKOUT HISTORY #" and press the enter key.
4. Scroll to choose the either "MANUAL RESET" or "AUTO RESET" and press the enter key to display the fault condition that was recorded.
5. Press the left arrow key to return to the LOCKOUT HISTORY # screen. Scroll up or down to highlight other choices and press the enter key to view the details of the boiler's condition when the lockout was recorded.

How to clear all lockout histories:

1. While on the "ERRORS" screen, hold the Left and Right arrow buttons simultaneously for 7 seconds.

Troubleshooting *(continued)*

Figure 114 Troubleshooting suggestions for WM97+ boilers — **Fault displays, diagnostics and corrective actions**

Display	Condition	Diagnostics	Corrective Action(s)
Nothing shown on display screen and boiler will not respond to call for heat	Control is not receiving 24V power	Check wiring for short circuit or incorrect wiring.	Correct wiring per wiring diagram including connection of transformer to the WM97+ control.
		Check 3-amp low voltage fuse on WM97+ control shown on page 103.	Replace fuse with proper part found in replacement part section of this manual. If fuse blows again recheck wiring per diagram.
		Check transformer connection to the WM97+ control per wiring diagram. Check for 24V output of transformer.	Replace transformer if it is is receiving 120Vac, but not outputting 24Vac.
Nothing is shown in display screen and no other boiler components are operating	Control is not receiving 120V power	Check service switch and/or circuit breaker to boiler turned is on.	Turn on service switch to power boiler.
		Is there 120 Volts at the service switch?	Troubleshoot and correct the power supply to the service switch.
		Is the WM97+'s ON/OFF POWER SWITCH located on top of the boiler	Turn the WM97+'s power switch to ON.
		Check for 120 volts at the line voltage terminal block located inside the top left electrical compartment	Correct wiring inside the control pod using the wiring diagram in this manual.
		Inspect 12-amp fuse as shown on page 103. Replace if necessary.	Replace the fuse with proper part found in the replacement part section of this manual. If fuse blows again recheck wiring per diagram.
Nothing is shown on display screen, but boiler is operating	Occurs if the communication is lost from the WM97+ control to the display.	Check for loose connections and proper pin alignment/ engagement on the WM97+ control's plug P9 and the back of the display circuit board.	Check for continuity on the wire harness from the display to the WM97+ control. See repair parts section for proper replacement part.
		Cycle power off and on using boiler power switch and check for operation.	Replace with new display module. See repair parts section for proper replacement part.
TEMP RISE TOO QUICKLY	Occurs if supply water temperature in heat exchanger rises faster than 2ºF per second during the first two minutes the burner is on.	Automatically resets after 1 minute delay or using manual reset on display. Manual reset is necessary after 5 automatic resets have occurred during the same Priority heat demand. Reset using manual reset screen on display	Verify water pipe is installed correctly per instructions in this manual.
			Verify proper circulator and speed for boiler size and system requirements.
			See message displayed TEMPERATURE SENSOR and follow procedure for loose connections.
SUPPLY 58F > RETURN	Boiler Out temperature has exceeded the Boiler In temperature by more than 58ºF	Automatically resets after 30 second delay or using manual reset on display.	Verify water pipe is installed correctly per instructions in this manual.
			Verify proper circulator and speed for boiler size and system requirements.
			See message displayed TEMPERATURE SENSOR and follow procedure for loose connections.
RETURN > SUPPLY	Occurs if a return water temperature is greater than the corresponding supply temperature by 10ºF or more.	Automatically resets when condition no longer exists.	Verify proper flow direction of the boiler circulator. This circulator must be installed to push water through the boiler's return pipe as shown on page 40. Verify proper boiler circulator speed setting in the WM97+ control.

Troubleshooting *(continued)*

Figure 114 Troubleshooting suggestions for WM97+ boilers — **Fault displays, diagnostics and corrective actions** *(cont.)*

Display	Condition	Diagnostics	Corrective Action(s)
TEMPERATURE SENSOR	Occurs if a temperature sensor has electrically shorted (SHORT) or has become disconnected (OPEN).	Will automatically reset if the condition clears	Check all the temperature readings of the boiler on the DIAGNOSTICS - TEMPERATURES menu to determine if any sensors are currenty displayed as SHORT or OPEN. Compare this to the boiler temperatures recorded in the DIAGNOSTICS - ERRORS - LOCKOUT HISTORY # - TEMPERATURES during the last several lockout conditions. Determine which sensors are suspect and measure their resistance value and compare it to the values shown in Figure 108, page 103. If the resistance values are incorrect replace the temperature sensor. Refer to repair parts section for proper part number. OUTDOOR TEMP is the optional outdoor air temperature sensor. If this are not being used they will always be shown as OPEN. This is normal unless the sensors were installed.
			Check wire harness for loose connections and pin engagement at sensor connection, chassis mount connection through control housing, and the WM97+ control. Unplug connection at sensor and at WM97+ control and check continuity between ends.
			If problem persists after checking items above replace WM97+ control. Refer to repair parts section for kit number.
	Occurs if dual temperature sensors values have spread by more that 10ºF if the burner is on	Automatically resets when sensors are within 10ºF.	Follow procedure for above for SHORT and OPEN sensor conditions to properly diagnose sensor. If measured resistance values of sensors convert to temperatures seperated by more than 10ºF replace the sensor.
FLUE TEMP TOO HIGH	Occurs if flue temperature sensor exceeds 216ºF	Automatic reset occurs if temperature drops below 216ºF for 2.5 minutes. Manual reset is required if the temperature rises above 225°F. Reset using manual reset screen on display	Follow procedure for above for SHORT and OPEN sensor conditions to properly diagnose sensor. In addition inspect heat exchanger combustion chamber and flueways for abnormal wear or buildup. Inspect vent system for abnormal wear or damage. Contact Weil-McLain Technical Support.
LOW WTR CUTOFF OPEN	Occurs if internal low water cutoff contacts open	Automatic reset occurs if contacts are open at least one second, but less than 5 seconds Manual reset of WM97+ control if contacts are open longer than 5 seconds	Check for low water condition in system. Repair system as necessary refer to piping section of this manual. If low water condition does not exist, check Diagnostics — Inputs screen to view status of Low Water Cutoff. If shown as OPEN check wiring between LWCO and WM97+ control. If wiring is alright, then replace the LWCO.
TANK SENSOR FAULT—TOP	CWH installations only: Occurs if Upper Tank Sensor has electrical shorted (SHORT) or has become disconnected (OPEN).	Will automatically reset if the condition clears.	Check temperature readings in the DIAGNOSTICS — TEMPERATURES menu to determine if any sensors currently display SHORT or OPEN. Determine which sensor is suspect and measure its resistance value and compare it to the value shown in Figure 108, page 103. If the resistance value is incorrect, replace the temperature sensor. Refer to the repair parts section for proper part number.
TANK SENSOR FAULT— BOTTOM	CWH installations only: Occurs if Lower Tank Sensor has electrical shorted (SHORT) or has become disconnected (OPEN).	Will automatically reset if the condition clears	Check temperature readings in the DIAGNOSTICS - TEMPERATURES menu to determine if any sensors currently display SHORT or OPEN. Determine which sensor is suspect and measure its resistance value and compare it to the value shown in Figure 108, page 103. If the resistance value is incorrect, replace the temperature sensor. Refer to the repair parts section for proper part number.
DISPLAY COMM	Occurs if display communications out for 30 seconds	Automatically resets when communication is re-established.	Check for a loose connection at the molex plug on the control and connection on the back of the display.

Troubleshooting *(continued)*

Figure 114 Troubleshooting suggestions for WM97+ boilers — **Fault displays, diagnostics and corrective actions** *(cont.)*

Display	Condition	Diagnostics	Corrective Action(s)
LIMIT OPEN	Occurs if manual or automatic reset limit opens.	Automatic external limit will reset 2½ minutes after external limit device closes. Manual limit fault must be reset by choosing Reset Lockout on the display.	Is there an external safety device connected? If yes, trouble shoot the external limit to determine and correct the cause that opened the limit. Also check for loose wiring connections.
			Remove the top right electrical cover and inspect the connector. Ensure a jumper is installed across the MAN LIMIT terminals if not using a manual reset external limit. Ensure a jumper is installed across the AUTO LIMIT terminals if not using a automatic reset external limit.
HIGH TEMP LIMIT	Boiler temperature sensor reached High Temp Limit setting (no higher than 200°F)	Reset using manual reset screen on display	Verify that high limit setting is at least 10°F above the setpoint temperature.
			Verify all isolation valves are open and circulators are programmed into the WM97+ control properly. The internal boiler circulator can be configured to turn on or off with DHW and heating zones. Refer to the WM97+ control Setup section to configure these properly for the system.
			Verify water pipe is installed correctly per instructions in this manual.
			Verify proper circulator sizing for boiler size and system requirements.
			See message displayed TEMPERATURE SENSOR and follow procedure for loose connections.
FLAME FAULT	Occurs if flame is detected when there should be no flame	Reset using manual reset screen on display	Burner may be operating too hot due to incorrect combustion. Inspect flame and conduct combustion test. Force boiler into hi-fire. Check flue gases with combustion analyzer and correct using the maintenance and startup procedure in this manual.
			Verify FLAME SIGNAL value quickly goes to zero on the DIAGNOSTICS - INPUTS screen when the gas valve closes.
			Check for flame at burner via flame current with burner off. Turn boiler off and watch flame through observation port. If flame continues after shutdown replace gas valve and venturi.
GAS VALVE FAULT	The WM97+ control has detected a problem with it gas valve output circuit	Control will do automatic retry; lockout if retry unsuccessful; retry 1 hour after lockout — restart if condition cleared, but lockout requiring manual reset if condition still present Requires manual reset if control is in lockout	Check wire harness connections between gas valve and WM97+ control.
			Check resistance between control and gas valve.
			Disconnect low-voltage wires connected to the boiler low-voltage terminal strip. Check all wire leads from system from system for stray voltage. Any voltage in excess of 0.5 volts will cause gas valve fault failures. Correct the cause of stray voltages before reconnecting wires. After correcting problem, check to see if gas valve fault issue is corrected.
			If lockout reoccurs replace WM97+ control.

Troubleshooting *(continued)*

Figure 114 Troubleshooting suggestions for WM97+ boilers — **Fault displays, diagnostics and corrective actions** *(cont.)*

Display	Condition	Diagnostics	Corrective Action(s)
BLOWER FAULT	Blower unable to reach required speed or does not reach 0 RPM when turned off. NOTICE: WM97+70 or 110 only — The blower will not rotate without a low voltage signal. Unplugging the low voltage blower wire harness will not allow or cause the boiler to rotate.	Reset using manual reset screen on display; WM97+ control will check again after 1 hour and will automatically restart if condition is corrected	Check wire harness for loose connections and pin engagement at blower connections, chassis mount connection through control housing, and WM97+ control. Unplug connection at blower and at WM97+ control and check continuity between ends. Blower is connected to both low voltage and line voltage harness.
			Check Diagnostics - Inputs screen with boiler in standby mode and blower not running. If BLOWER SPEED is not 0 RPM then replace blower.
			If blower does not rotate during ignition sequence check for 120V power at blower connection. If 120Vac power at blower motor and it doesn't start replace blower. Check power at WM97+ control. If 120Vac is not present at WM97+ control when boiler is powered replace WM97+ control. Refer to repair parts section.
IGNITION FAULT	Boiler went through 5 ignition attempts and never detected flame	Automatically resets after 1 hour or can be reset by performing manual reset on boiler.	Check condensate trap for blockage allowing condensate to accumulate inside heat exchanger. Check ignition cable connection.
			Fouled, worn, bent, or faulty igniter. Fouled igniters can be cleaned for additional use with steel wool. Worn or badly fouled igniters should be replaced with the proper repair part. Igniter rods should be parallel with a 3.5 mm (0.138 in) spark gap. NOTICE: Thin white deposits on the igniter are typical, but brown or black deposits could be the result of flue gas recirculation. Thoroughly inspect the venting system and termination for the possibility of leakage or flue gas feedback into the air line.
			Dirty burner and/or heat exchanger will cause high back pressure and poor ignition. Follow procedure in maintenance section of this manual to clean burner and heat exchanger. Visual inspection of flueways may not be sufficient to diagnose condition.
			Check combustion settings on high and low fire and adjust per setup instructions if necessary.
			Check incoming gas pressure with boiler off and at high fire. Adjust within limits on rating label.
			Verify correct boiler model is selected in control and high altitude is selected for installations 5,500 feet above sea level.
			Check ignition cable resistance. Should measure 1000 Ohms (+/- 50 Ohms)
			Check for flue pipe and intake pipe restrictions or blockage
			Check burner fasteners and gaskets
			Check venturi gaskets and proper propane orifice bushing

Maintenance

⚠WARNING DO NOT SERVICE THE BOILER WITHOUT A WM97+ MAINTENANCE KIT AVAILABLE

The WM97+ maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler.

Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage.

See Figure 123, page 119 for part number.

Disconnect power

⚠WARNING Electrical shock hazard — Disconnect all electrical power to the boiler before attempting maintenance procedures. Failure to complete could result in severe personal injury, death or substantial property damage.

Re-install boiler jacket front door after startup or servicing

⚠WARNING Reinstall boiler jacket front door after start-up or servicing. The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Inspect boiler jacket door gaskets. Gaskets must be in good condition, with no tears or gaps. Replace if necessary.

Failure to keep the door securely sealed and fastened could result in severe personal injury or death.

Start-up and check/out

⚠WARNING Removing and reinstalling components can change boiler behavior. After any maintenance procedure, you must prove the boiler is operating correctly. To do so, follow the complete procedure for boiler and system start-up, beginning on page 87. Failure to comply could result in severe personal injury, death or substantial property damage.

Boiler circulator repair

Circulator cartridge replacement

1. The circulator supplied with the boiler is a water-lubricated, cartridge-type circulator. If the circulator fails, try replacing the circulator cartridge instead of replacing the entire circulator. Replacing the circulator can be much more complicated, requiring more time to do.
2. Purchase the circulator cartridge, available through Weil-McLain distributors. Find the cartridge part number on the circulator label or in Figure 130, page 126 (WM97+70 or 110) or Figure 132, page 128 (WM97+155).
3. Isolate and drain the boiler to at least below the level of the boiler internal circulator.
   a. Turn the boiler ON/OFF switch to OFF.
   b. TURN OFF all power to the boiler.
   c. Close the external manual gas valve.
   d. Close the external piping isolation valves on the boiler supply and return lines.
   e. Close the isolation valves in the DHW circuit if connected to the bottom boiler connections.
   f. WM97+70 or 110 — Close the expansion tank shutoff valve (item 160, Figure 131, page 127).
   g. Connect a hose to the boiler drain valve. Open the drain valve and drain the boiler to at least below the level of the boiler internal circulator.
   h. To allow air to flow into the boiler piping during draining, lift the relief valve lever slightly or open a purge valve in the external piping, if available.
4. Disconnect the circulator wire harness connector.
5. Follow instructions supplied with the replacement circulator cartridge to remove the circulator motor housing and replace the cartridge. Reassemble the circulator.
6. Refill the boiler with water, allowing air to escape through the relief valve or purge valve, if available.
7. Reconnect the circulator wiring connector.
8. Close the boiler drain valve. Open all isolation valves, including the internal expansion tank isolation valve.
9. Restore power and restart the boiler, following all procedures in the Start-up instructions, beginning on page 87.

Oiled bearing circulators

1. The circulator installed in the WM97+ boiler is water-lubricated. No oiling is required.
2. Check other circulators in the system. Oil any circulators requiring oil, following circulator manufacturer's instructions. Over-oiling will damage the circulator.

Part number 550-142-120/0113

Maintenance *(continued)*

Cleaning the heat exchanger WATER SIDE, when required

1. Isolate the boiler from the heating system.
2. Obtain Sentinel X400 cleaner from Weil-McLain. Follow instructions supplied with the cleaner to clean the boiler heat exchanger.

⚠WARNING Use ONLY the cleaning product available from Weil-McLain, Sentinel X400. See the Repair Parts section at the end of this manual for ordering information.

Using other cleaning materials or methods could cause permanent damage to the boiler heat exchanger.

⚠WARNING Inspect the heating system water. If there is evidence of sediment or corrosion, the boiler must be isolated from the system. The system must then be thoroughly cleaned to remove all sediment.

Isolated the cause of the system corrosion and correct the problem(s) before placing the boiler back in service.

Failure to comply could result in severe personal injury, death or substantial property damage.

Checking the heat exchanger-to-condensate dish seal

1. Remove the front door and rotate the control housing assembly forward as shown in Figure 115 so it will be out of the way or disconnect the wire harnesses and place the control aside in a safe location.
2. Place a container under the boiler for drainage.
3. Disconnect the flexible condensate drain tube from the condensate drain piping so it's outlet end is free to move.
4. Loosen the condensate trap upper ferrule (see Figure 115) and rotate the trap assembly so the flexible drain tube can be lifted as shown. Tighten the upper ferrule when in position.

⚠WARNING The boiler is shipped with a 24-inch flexible tube. If the tube has been cut shorter, attach a ¾" PVC coupling to the flexible tube with tape. Then use a length of ¾" PVC pipe long enough to locate the funnel as directed.

5. Insert a funnel into the open end of the flexible tube. Wrap the funnel-to-tube joint with tape so it will be watertight.
6. Lift the funnel up as shown in Figure 115 so it is from 6 to 10 inches above the bottom of the boiler.
7. Pour one gallon of water (no more than one gallon) slowly into the funnel. Use tape or cord to secure the funnel and flexible tube up in position so the funnel remains 6 to 10 inches above the bottom of the boiler.
8. Use a flashlight and mirror to insepct around the perimeter of the heat exchanger where it joins the condensate dish (see Figure 116 for a WM97+70 or 110 or Figure 117 for WM97+155).
9. There must be no signs of water leakage anywhere around the heat exchanger-to-condensate dish joint.

⚠WARNING If there are signs of leakage, wipe the area with a clean rag to ensure there is a leak and not just splashed water. If the leak continues, the boiler must not be operated until a new sealing ring is obtained. Follow the instructions supplied with the sealing ring kit to disassemble boiler components as necessary to access and replace the seal.

10. If there are no indications of leakage, the seal is acceptable.
11. Remove the funnel, drain the water into the container below, return the condensate trap assembly to its original position, and re-connect the flexible drain tube to the condensate drain tubing.

Figure 115 Adding water to exchanger for condensate dish seal check

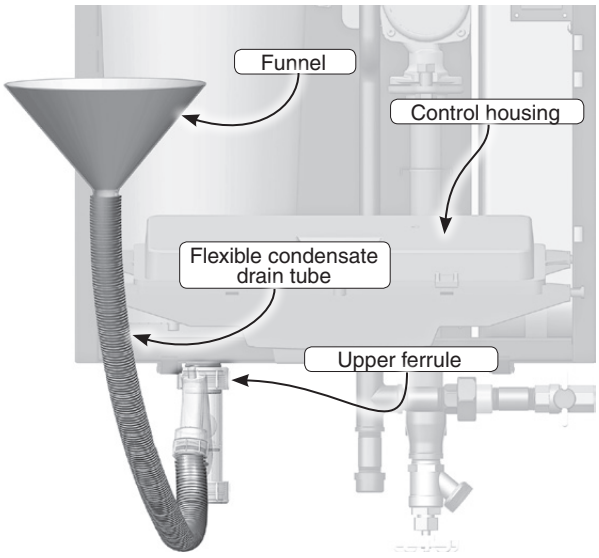


Figure 116 Inspect the heat exchanger-to-condensate dish joints — 70/110

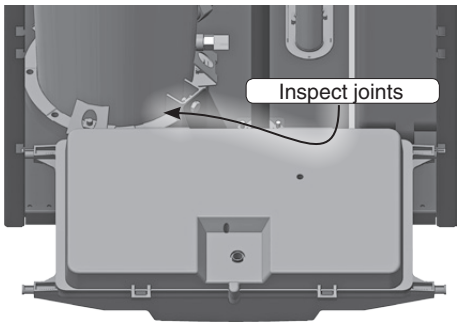
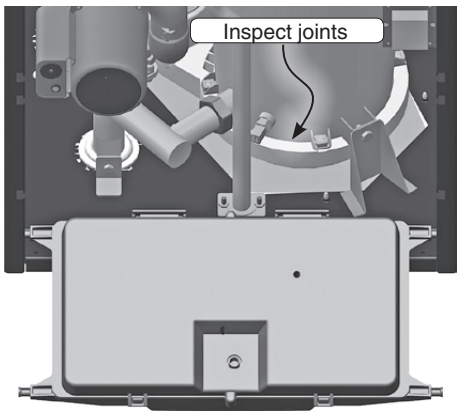


Figure 117 Inspect the heat exchanger-to-condensate dish joints — 155



Cleaning heat exchanger flue side, 70/110

Cleaning the WM97+70 or 110 heat exchanger FLUE SIDE or accessing the burner, if required

⚠WARNING The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 96 of this manual. Failure to comply could result in severe personal injury.

Tools required

1. Long-handled Torx driver, #20.
2. Phillips head screwdriver, #2.
3. Torque wrench.
4. Putty knife.
5. Wrench or socket, 10 mm.

Before proceeding:

1. Shut down the boiler:
   a. Follow "To Turn Off Gas to Appliance" instructions on boiler and Lighting instructions. Close the boiler manual gas valve.
2. Allow time for the boiler to cool to room temperature if it has been firing.
3. Remove jacket front door by releasing the two clamps at the bottom of the jacket door.
4. Lift the jacket door away from the boiler to remove.

Remove components to allow access

1. See Figure 119, page 113 part A to locate components referenced in the following.
2. See Figure 119, page 113 part B.
   a. Pull the silencer straight forward until it snaps free of the blower housing. Set the air silencer aside. Rotate the air inlet silencer if needed to clear as it is removed.
   b. Remove the gas valve retainer clip (item 4) and set aside. Pull the gas valve slightly to the right until it disengages from the venturi (item 5).

⚠WARNING Support the gas valve. DO NOT allow it to hang from the gas valve flex line. Make sure the gas valve-to-venturi O-ring (item 5, Figure 10, page 15) remains on the gas valve sleeve.

   c. Disconnect the blower end of the gas valve sense line (item 8).
   d. Remove the four 10-mm hex nuts (item 9)that secure the heat exchanger cover plate (item 6).
   e. Disconnect the ground wire and electrode wire from the igniter (item 7).
   f. Remove the blower retainer clip (item 15). Set aside.
   g. Remove the blower by pulling down. Disconnect the two blower wiring harnesses on the back side of the blower.
   h. Lift the cover plate/venturi/burner assembly vertically until the refractory (part 3, item 12) clears the heat exchanger.
   i. Tilt the cover plate/venturi/burner assembly slightly forward. Then pull the assembly forward and out of the jacket.

Figure 118 Legend for Figure 119, page 113

A	Boiler interior	**6**	Heat exchanger cover plate
B	Boiler interior, with components disconnected to allow removal of combustion chamber cover plate	**7**	Ignitor assembly
		8	Gas valve sense line
C	Combustion chamber cover plate and components removed from boiler	**9**	(4) Combustion chamber cover plate retainer nuts
D	Disassembling to access the burner	**10**	Burner
E	Heat exchanger interior	**11**	Putty knife
1	Inlet air silencer	**12**	Refractory
2	Blower assembly	**13**	Burner gasket
3	Gas valve	**14**	(3) Burner retainer screws
4	Gas valve retainer clip	**15**	Blower retainer clip
5	Venturi assembly		

   j. Remove the igniter by removing the two Phillips head igniter screws. Set the igniter, its gasket and screws aside. Be careful when handling the igniter not to damage the igniter ceramic.
   k. Inspect the igniter ceramic and electrodes. Clean the electrodes carefully with steel wool. If the igniter ceramic is cracked or damaged, replace the igniter with a new one.

⚠WARNING Handle the cover plate/venturi/burner assembly carefully to avoid damage to the igniter or refractory. Place the assembly on a clean, flat surface with the assembly on its side, as shown in Figure 119, page 113 part C and part D.

3. See Figure 119, page 113 part C.
   a. Use a wide-blade putty knife (item 11) to gently pry the refractory from the heat exchanger cover plate. The refractory is attached with silicone adhesive and should separate with a little pressure on the putty knife.

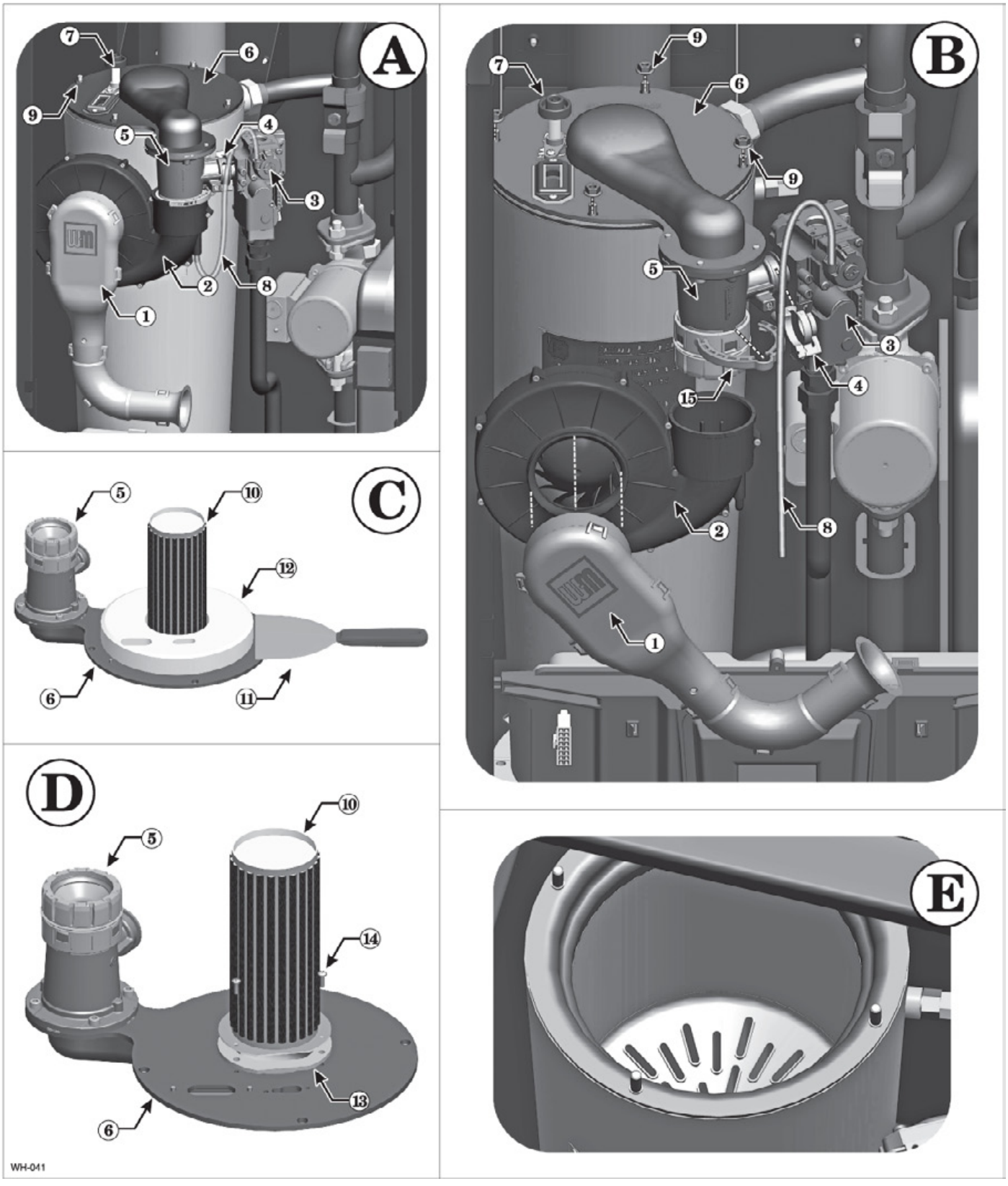
⚠WARNING DO NOT gouge or crack the refractory. The refractory is made of ceramic fiber materials. Read the ceramic fiber WARNING on page 96 before handling or disposing of ceramic fiber materials.

Inspect and clean the burner

1. See Figure 119, page 113 part D.
   a. Slide the refractory (item 12) over the burner and off. Set the refractory aside where it will be kept clean and protected from damage. If the refractory is damaged, it must be discarded and replaced with a new one.
   b. Remove the three #20 Torx screws (item 14) securing the burner (item 10) to the cover plate. Set aside.
   c. Remove the burner and its gasket (item 13).
   d. Inspect the interior of the burner. Brush and vacuum the interior if needed to remove lint or sediment. Alternative cleaning methods: • blow air or nitrogen from the inside out; • clean with a water spray from inside the burner;

Cleaning heat exchanger flue side, 70/110 *(continued)*

Figure 119 Accessing the burner or heat exchanger (see Legend on next page)



Cleaning heat exchanger flue side, 70/110 *(continued)*

• swirl the burner thoroughly in a bucket of mild liquid laundry detergent water, then rinse thoroughly.

e. Inspect the burner exterior. It must be in good condition, with no visible damage.

f. Inspect the burner gasket. If the gasket is damaged, obtain a new gasket before re-installing the burner.

Inspect and clean the heat exchanger

1. Access the heat exchanger interior by following the previous instructions.
2. See Figure 119, page 113 part E.
3. Use a strong light to visually inspect the interior of the heat exchanger. Make sure the flueways (tubes) are clear and unobstructed.
   a. If soot or debris is present, obtain a fresh water hose with sprayer.
4. Use a vacuum cleaner to remove any accumulation on the heating surfaces. This includes removing any pieces of refractory that may have dropped into the exchanger.

⚠WARNING DO NOT use any solvent when cleaning the exchanger.

5. If the vacuum cleaner is unable to clean completely, wash the heating surfaces with clean, warm water.
   a. Place a bucket under the boiler condensate drain connection.
   b. Then loosen the condensate trap upper nut and slide the trap off of the drain connection. (See Figure 71, page 62 for reference.)
   c. Spray water into the heat exchanger and tubes to remove sediment. Collect water in the bucket below.
6. Inspect the heat exchanger cover plate refractory. Replace if insulation is damaged.

Reinstall components

1. See Figure 119, page 113 for reference.
2. Reinstall the burner (item 10) and burner gasket (item 13) on the cover plate (item 6). Tighten the burner screws (item 14) using a torque wrench. The screws must be secure, but the torque must not exceed 20 inch-pounds.
3. Apply a ring of silicone adhesive on the cover plate (to secure the refractory).
4. Slide the refractory (item 12) over the burner. Align the refractory and press in place.
5. **Before** handling the assembly, allow the adhesive to set enough that the refractory is firmly held in place.
6. Reinstall the igniter assembly (item 7).
   a. The igniter gasket must be intact and in good condition. Replace with a new gasket if necessary.
   b. Insert the igniter into the cover plate opening, with the gasket in position.
   c. Reinstall the two Phillips head screws finger tight.
   d. Use a torque wrench to tighten the igniter screws. DO NOT exceed 20 inch-pounds torque.
7. Reinstall the venturi/cover plate assembly (items 5 and 6) and secure the cover plate with 10-mm hex nuts (item 9).
8. Reconnect the igniter wire and the igniter ground wire.

⚠WARNING You must gradually tighten the cover plate nuts using a torque wrench. The final torque MUST NOT exceed 45 inch-pounds. Alternate tightening until all nuts reach 45 inch-pounds.

9. Reinstall the blower.
   a. Reconnect the two blower wiring harnesses.
   b. Slide the blower up onto the venturi sleeve.
   c. Reinstall the blower retainer clip, item 15.
10. Reinstall the air inlet silencer (item 1) by pressing onto the air inlet adapter. Rotate into the normal vertical position (see part A) of Figure 119, page 113.
11. Slide the gas valve (item 3) outlet collar into the venturi (item 5) opening. Make sure the gas valve-to-venturi O-ring (item 5, Figure 10, page 15) is in place and in good condition. Inspect the gas valve flex line, making sure there are no signs of wear or damage. Replace if necessary.
12. Slide the gas valve retainer clip (item 4) into position to secure the gas valve.
13. Reinstall the condensate trap on the boiler condensate drain connection. (See Figure 71, page 62 for reference.)

⚠WARNING Perform a complete start-up procedure when putting the boiler back into service. See page 87 and all instructions for start-up and verification. Include a soap suds leak test on all interior and exterior gas piping after starting the boiler.

Cleaning heat exchanger flue side, 155

Cleaning the WM97+155 heat exchanger FLUE SIDE or accessing the burner, when required

⚠WARNING The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 96 of this manual. Failure to comply could result in severe personal injury.

Tools required

1. Metric wrench or socket, 10 mm.
2. Phillips head screwdriver, #2.
3. Torque wrench.
4. Putty knife.

Before proceeding:

1. Shut down the boiler:
   a. Follow "To Turn Off Gas to Appliance" instructions on boiler and Lighting instructions.
   b. Close the boiler manual gas valve.
2. Allow time for the boiler to cool to room temperature if it has been firing.
3. Remove jacket front door by releasing the two clamps at the bottom of the jacket door.
4. Lift the jacket door away from the boiler to remove.

Remove and inspect the igniter assembly

1. See Figure 121, page 117 part A.
2. NOTE: The igniter assembly may be left in place if only accessing the burner. If the heat exchanger cover plate is to be removed, the igniter assembly must be removed FIRST.
3. Disconnect the ground wire and electrode wire from the igniter (item 7).
4. Remove the two Phillips-head screws securing the igniter to the heat exchanger cover plate (item 6).
5. Carefully slide the igniter out of its mounting slot.
6. Remove and inspect the igniter gasket. Replace with a new gasket if necessary.
7. Inspect the igniter ceramic and electrodes. Clean the electrodes carefully with steel wool. If the igniter ceramic is cracked or damaged, replace the igniter with a new one.

Remove, inspect and clean the burner

1. See Figure 121, page 117 part A, part B and part C.
2. Use a Phillips screwdriver to remove the three M4 screws and flat washers (item 10) that secure the burner access cover (item 4) to the heat exchanger cover plate (item 6).
3. Remove the burner cover plate (item 4) and the burner (item 11).
4. Leave the burner gasket (item 12) in place in the heat exchanger cover plate until the plate is removed from the heat exchanger. This gasket is ceramic fiber and may pull apart or stick to the burner on removal.
5. Inspect the burner cover plate seal (item 13). Discard and use a new seal during re-assembly if the seal is damaged in any way.
6. Inspect the interior of the burner. Brush and vacuum the interior if needed to remove lint or sediment. Alternative cleaning methods: • blow air or nitrogen from the inside out; • clean with a water spray from inside the burner; • swirl the burner thoroughly in a bucket of mild liquid laundry detergent water, then rinse thoroughly.
7. Inspect the burner exterior. It must be in good condition, with no visible damage.
8. Clean the under side of the burner flange (see item 15) with a soft brush to remove any gasket fragments remaining.
9. If the heat exchanger cover plate will not be removed (that is, if servicing the burner only), remove the burner gasket from the heat exchanger cover plate if still in place. Do not let fragments drop into the heat exchanger if the gasket pulls apart during removal. Replace the gasket with a new one during reassembly.

Remove components to access the heat exchanger flue side

1. See Figure 121, page 117 part A to locate components referenced in the following.
2. Remove the air silencer and disconnect gas line:
   a. See Figure 121, page 117 part A and part B.
   b. Locate the air silencer clip, item 8. Pull on the right side of the clip until it rotates forward as shown in part A inset.
   c. Slide the air silencer (item 1) down and off of the venturi (item 5). Set the air silencer aside.
   d. Disconnect the flexible gas line where it connects just below the gas valve (item 3). Lay the free end of the flexible gas line to the side.

⚠WARNING Use two wrenches when disconnecting the flexible gas line to prevent damage to the gas valve and other gas line components.

   e. Disconnect the two wire harnesses connected to the blower and the wire harness connected to the gas valve.
3. Remove the burner following the procedure in this section. Then remove the heat exchanger cover plate/blower/venturi/gas valve assembly:
   a. See Figure 121, page 117 part A, part C and part D.
   b. Use a 10-mm wrench to remove the five M6 nuts (item 9) that secure the heat exchanger cover plate (item 6) to the heat exchanger.
   c. Lift the cover plate/blower/venturi/gas valve assembly vertically until the refractory (part D, item 16) clears the heat exchanger.
   d. Then pull the assembly forward and out of the jacket.
   e. Carefully place the cover plate/blower/venturi/gas valve assembly aside.

⚠WARNING Handle the cover plate/venturi/burner assembly carefully to avoid damage to the components or refractory. Place the assembly on a clean, flat surface.

Cleaning heat exchanger flue side, 155 *(continued)*

Inspect refractory and replace burner gasket

1. See Figure 121, page 117 part D.
   a. Inspect the refractory to make sure it is intact, with no visible damage.
   b. If the refractory must be replaced, use a wide-blade putty knife to gently pry the refractory from the heat exchanger cover plate. The refractory is attached with silicone adhesive and should separate with a little pressure on the putty knife.

⚠WARNING DO NOT gouge or crack the refractory. The refractory is made of ceramic fiber materials. Read the ceramic fiber WARNING on page 96 before handling or disposing of ceramic fiber materials.

   c. When replacing the refractory, apply a ring of silicone adhesive on the cover plate. Place the refractory onto the cover plate. Before handling the assembly, allow the adhesive to set enough that the refractory is firmly held in place.
2. Remove the burner gasket (item 12) from the heat exchanger cover plate.
3. Clean the gasket surface with a soft brush to remove any gasket residue.
4. The burner gasket must be replaced with a new one when the boiler is re-assembled after servicing.

Inspect and clean the heat exchanger

1. Access the heat exchanger interior by following the previous instructions. Remove and inspect the heat exchanger cover plate gasket. Replace if necessary.
2. See Figure 121, page 117 part E.
3. Use a strong light to visually inspect the interior of the heat exchanger. Make sure the flueways (tubes) are clear and unobstructed.
4. Use a vacuum cleaner to remove any accumulation on the heating surfaces. This includes removing any pieces of refractory than may have dropped into the exchanger.

⚠WARNING DO NOT use any solvent when cleaning the exchanger.

5. If the vacuum cleaner is unable to clean completely, wash the heating surfaces with clean, warm water.
   a. Place a bucket under the boiler condensate drain connection.
   b. Then loosen the condensate trap upper nut and slide the trap off of the drain connection. (See Figure 71, page 62 for reference.)
   c. Spray water into the heat exchanger and tubes to remove sediment. Collect water in the bucket below.
6. Inspect the heat exchanger cover plate gasket. Replace if is damaged in any way.

Reinstall components

1. See Figure 121, page 117 for reference.
2. First, re-install the heat exchanger cover plate/refractory/blower/venturi/gas valve assembly on the heat exchanger.
   a. Seat the heat exchanger cover plate gasket on the heat exchanger sealing surface.
   b. Secure the heat exchanger cover plate (item 6) to the heat exchanger with the five 6-mm nuts using a 10-mm wrench.

Figure 120 Legend for Figure 121, page 117

A	Boiler interior	**8**	Air silencer clip
B	Burner assembly	**9**	(5) Heat exchanger cover plate retainer nuts,
C	Boiler interior, showing heat exchanger cover plate (item 6) and burner cover plate seal (item 13), with burner assembly removed	**10**	Burner cover retainer screws, M4 Phillips plus flat washers
D	Exchanger cover plate, blower and other components, showing combustion chamber refractory (item 16)	**11**	Burner
E	Heat exchanger interior	**12**	Burner gasket
F	Boiler lower interior, showing condensate dish (item 20)	**13**	Burner access cover seal
1	Inlet air silencer	**14**	Burner gasket sealing surface
2	Blower assembly	**15**	Burner sealing surface (lower surface of burner flange)
3	Gas valve	**16**	Combustion chamber refractory
4	Burner access cover	**17**	Heat exchanger tube sheet
5	Venturi assembly	**18**	Heat exchanger cover plate gasket
6	Heat exchanger cover plate	**19**	Heat exchanger outer shell
7	Igniter assembly	**20**	Condensate dish
		21	Condensate dish joint
		22	Control housing, rotated forward

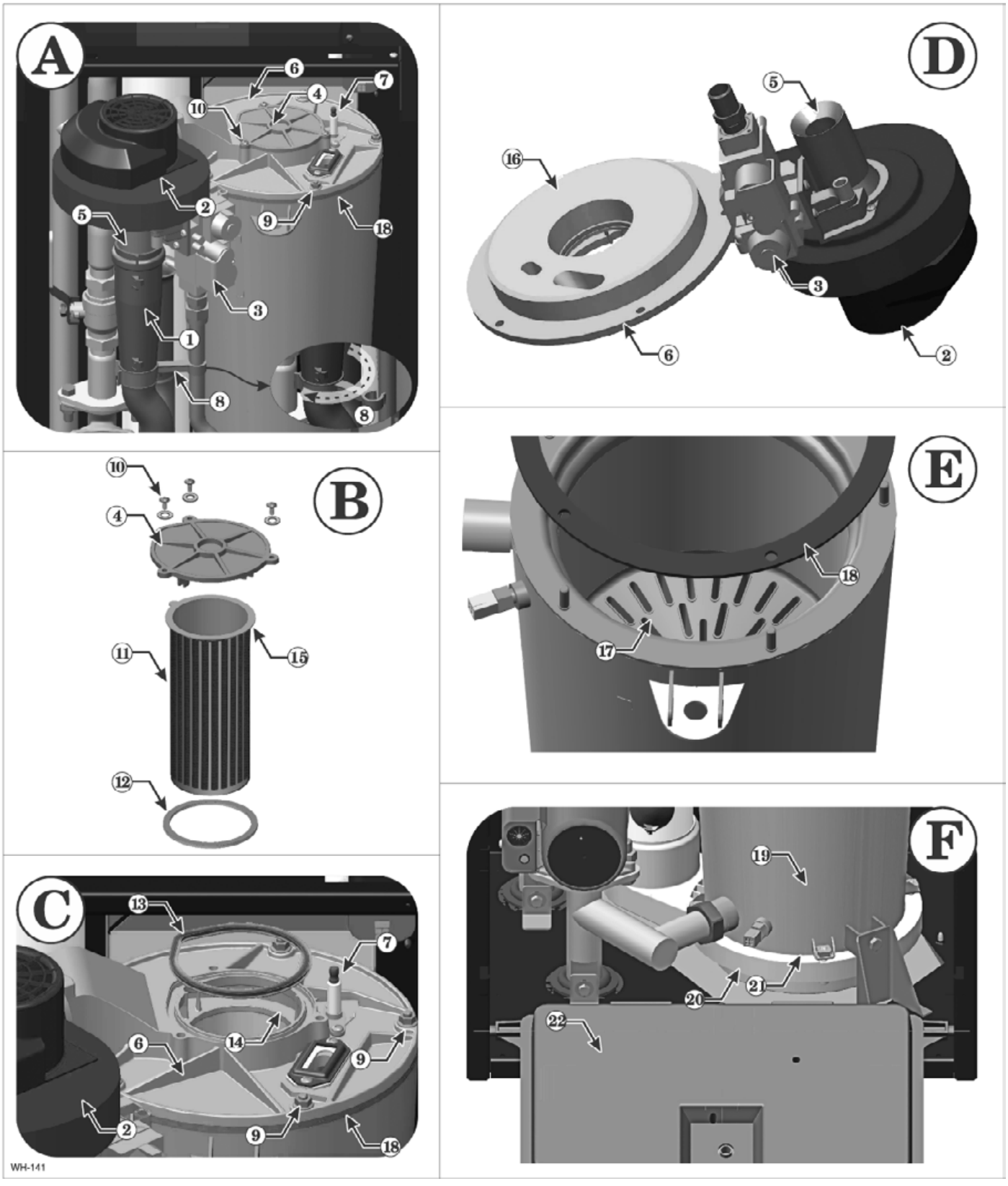
   c. Tighten the nuts gradually, adjusting a little at a time. Alternate and repeat until all are tightened evenly.
   d. Do not over-tighten (torques no more than 45 inch-pounds).
3. Reinstall the burner (item 11), burner gasket (item 12) and burner access cover seal (item 13) on the heat exchanger cover plate (item 6).
   a. Insert and tighten the burner cover plate screws and washers (item 10) using a Phillips screwdriver. The screws must be secure, with torque no more than 20 inch-pounds.
4. Reinstall the igniter assembly (item 7).
   a. The igniter gasket must be intact and in good condition. Replace with a new gasket if necessary.
   b. Insert the igniter into the cover plate opening, with the gasket in position.
   c. Reinstall the two Phillips head screws finger tight.
   d. Use a torque wrench to tighten the igniter screws. DO NOT exceed 25 inch-pounds torque.
   e. Reconnect the igniter wire and the igniter ground wire.
5. Reconnect the flexible gas line to the gas valve using two wrenches.
6. Reinstall the air inlet silencer (item 1) by pressing onto the venturi (item 5). Rotate the air silencer clip (item 8) and snap it onto the gas line.
7. Reconnect the wire harnesses to the blower and gas valve.
8. Reinstall the condensate trap on the boiler condensate drain connection. (See Figure 71, page 62 for reference.)

⚠WARNING Perform a complete start-up procedure when putting the boiler back into service. See page 87 and all instructions for start-up and verification. Include a soap suds leak test on all interior and exterior gas piping after starting the boiler.

Part number 550-142-120/0113

Cleaning heat exchanger flue side, 155 *(continued)*

Figure 121 Accessing the burner or heat exchanger (see Legend on next page)



Replacement parts

⚠WARNING **DO NOT SERVICE THE BOILER WITHOUT A WM97+ MAINTENANCE KIT AVAILABLE**

The WM97+ maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler. Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage. See Figure 123, page 119 for part number.

REPLACEMENT PART NUMBERS

Weil-McLain part numbers are found in this manual and in *Weil-McLain Boilers and Controls Repair Parts Lists*.

WHEN OPERATING THE BOILER ON PROPANE GAS

⚠WARNING **ALL WM97+ boilers must be converted in order to operate with propane gas.**

Figure 122 Propane conversion kits and instructions

Boiler model	Kit part #	Kit location	Installation instructions
WM97+70	540-202-834	Shipped loose with boiler	See page 14
WM97+110	540-202-835	Shipped loose with boiler	See page 14
WM97+155	540-202-836	Shipped loose with boiler	See page 14

⚠WARNING **Failure to adhere to these guidelines can result in severe personal injury, death or substantial property damage.**

OBTAIN PARTS ONLY THROUGH WEIL-McLAIN

Replacement parts must be purchased through a local Weil-McLain distributor. When ordering, specify boiler model and size and include description and part number of replacement part. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.

THE BOILER CONTAINS CERAMIC FIBER MATERIALS

The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 96 of this manual. Failure to comply could result in severe personal injury.

REINSTALL JACKET DOOR

Inspect boiler jacket front door gaskets and reinstall boiler jacket front door after start or servicing. The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the door securely fastened could result in severe personal injury or death.

BEFORE SERVICING or MAKING CONNECTIONS —

ALWAYS TURN POWER OFF TO THE BOILER TO PREVENT ELECTRICAL SURGES, WHICH CAN DAMAGE BOILER COMPONENTS.

LABEL WIRES BEFORE REMOVING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Replacement parts *(continued)*

Figure 123 Miscellaneous parts and kits

Item	Description	Part Number
	CHEMICALS	
100	Antifreeze, Sentinel X500	592-900-004
	Corrosion inhibitor, Sentinel X100	592-900-002
	Sentinel X100 Quick Test Kit	592-900-005
	Cleaner, Sentinel X400	592-900-003
	BOILER ACCESSORIES	
110	WM97+70/110 maintenance kit — igniter, igniter gasket, venturi gasket, cover plate gasket, venturi-gas valve o-ring, refractory, silicone, inhibitor test kit, clips	383-700-165
	WM97+155 maintenance kit — igniter, igniter gasket, venturi gasket, cover plate gasket, venturi-gas valve o-ring, refractory, silicone, inhibitor test kit, clips	383-700-200
120	Wall-mount kit (supplied with boiler) — wall mount bracket and hardware	383-700-118
130	Condensate trap kit (supplied with boiler) — condensate trap assembly and flexible line	560-907-722
	CONDENSATE HANDLING ACCESSORIES	
140	Condensate neutralizer kit	383-500-631
	VENT/AIR PARTS AND KITS (PVC or STAINLESS STEEL) available from Weil-McLain	
150	Weil-McLain sidewall vent/air cap termination kit for PVC vent and air pipes Includes W-M sidewall vent/air termination cap, inside and outside cover plates, and mounting hardware; openings are sized for 3" PVC pipe (requires field-installed 3 x 2 adapter if using 2" vent/air pipes)	383-500-397
160	Weil-McLain sidewall vent/air cap termination kit for AL29-4C vent pipe and PVC air pipe Includes W-M sidewall vent/air termination cap, inside and outside cover plates, and mounting hardware; openings are sized for 3" PVC pipe (requires field-installed 3 x 2 adapter if using 2" vent/air pipes)	382-200-430

Item	Description	Part Number
170	Sidewall separate pipes vent/air termination kits (includes two cover plates) Kit for 2" PVC vent and air pipes Kit for 3" PVC vent and air pipes Kit for 3" AL29-4C SS vent pipe and PVC air pipe	 383-700-171 383-500-100 383-700-172
180	PVC concentric vent kit — horizontal or vertical (includes components for concentric assembly) Kit for 2" PVC vent and air pipes Kit for 3" PVC vent and air pipes	 383-700-167 383-500-350
190	Bird screens For 2" PVC vent and air pipes For 3" PVC vent and air pipes	 560-907-728 383-500-105
	VENT/AIR PARTS AND KITS (POLYPROPYLENE PIPE) available from M&G Simpson-Duravent ONLY	
200	M&G Simpson-Duravent PolyPro SIDEWALL concentric vent/air kit (color: white) 2" polypropylene pipe 3" polypropylene pipe	 24PPS-HK 35PPS-HK
210	M&G Simpson-Duravent PolyPro VERTICAL concentric vent/air kit; color = black (VK suffix) or terra cotta (TC suffix) 2" polypropylene pipe 3" polypropylene pipe	 24PPS-VK 35PPS-VK
220	M&G Simpson-Duravent PolyPro SIDEWALL separate air and vent pipes 2" polypropylene pipe 3" polypropylene pipe	 2PPS-HTP 3PPS-HTP
	VENT/AIR PARTS AND KITS (POLYPROPYLEN PIPE) available from Centrotherm Eco Systems ONLY	
230	Centrotherm INNOFLUE SIDEWALL concentric vent/air kit 3" polypropylene pipe 2" stainless steel pipe 3" stainless steel pipe	 ICWT3452 ICWS2413 ICWS3513
240	Centrotherm INNOFLUE VERTICAL concentric vent/air kit 2" polypropylene pipe 3" polypropylene pipe	 ICRT2439 ICRT3539

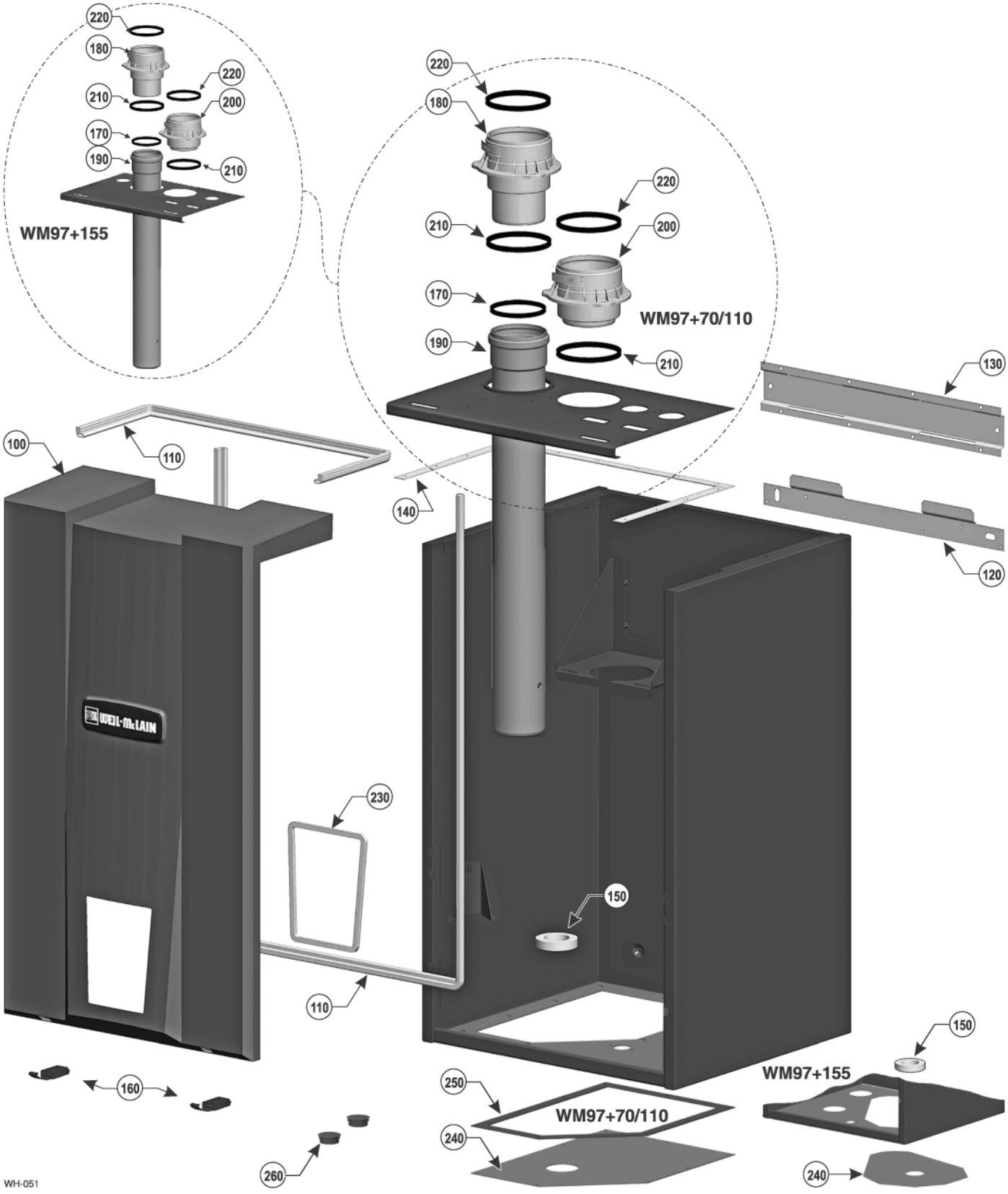
Replacement parts *(continued)*

Figure 124 Jacket parts — **WM97+70/110/155** (see Figure 125, page 121 for illustration)

Item	Name	Description / contents	Part Number	
			70 / 110	155
100	Front door	Front door, seals, logo, and labels	383-700-116	383-700-116
110	Front door to jacket seals	Seals for front door to jacket	383-700-117	383-700-117
120	Wall-mount bracket (wall side)	Bracket and hardware	383-700-118	383-700-118
130	Wall-mount bracket (boiler side)	Bracket and hardware	383-700-119	383-700-119
140	Gaskets - upper panel to cabinet	Gaskets - top panel to cabinet (riveted top)	383-700-120	N/A
		Gaskets - top panel to cabinet (screwed top)	383-700-188	383-700-188
150	Gasket - heat exchanger to bottom panel	Gasket - condensate trap to bottom panel	383-700-121	383-700-121
160	Door latch	Latch and hardware	383-700-122	383-700-122
170	Gasket internal flue pipe to adapter	Gasket fits inner diameter of boiler flue pipe	590-318-051	590-318-051
180	Flue pipe adapter	Top flue adapter with internal gasket	560-907-719	560-907-719
190	Boiler flue pipe	Internal flue pipe and gasket	560-907-720	560-907-720
200	Air inlet adapter	Top air inlet adapter with internal gasket	560-907-718	560-907-718
210	Gasket - pipe adapter to cabinet	Gasket - flue adapter to cabinet	590-300-031	590-300-031
220	Gasket - pipe adapter to system pipe	Gasket fits inner diameter of top adapter	590-318-052	590-318-052
230	Front door to display seal	One seal (attached to control housing)	590-300-028	590-300-028
240	Jacket bottom access panel kit	Jacket access panel, gasket (item 250) and screws	383-700-204	383-700-201
250	Bottom access panel gasket	Gasket only	590-318-059	N/A
260	CWH wire harness opening plugs (not shown)	One plug	561-444-190	561-444-190

Replacement parts *(continued)*

Figure 125 Jacket assembly — **WM97+70/110/155** (see Figure 124, page 120 for part numbers)



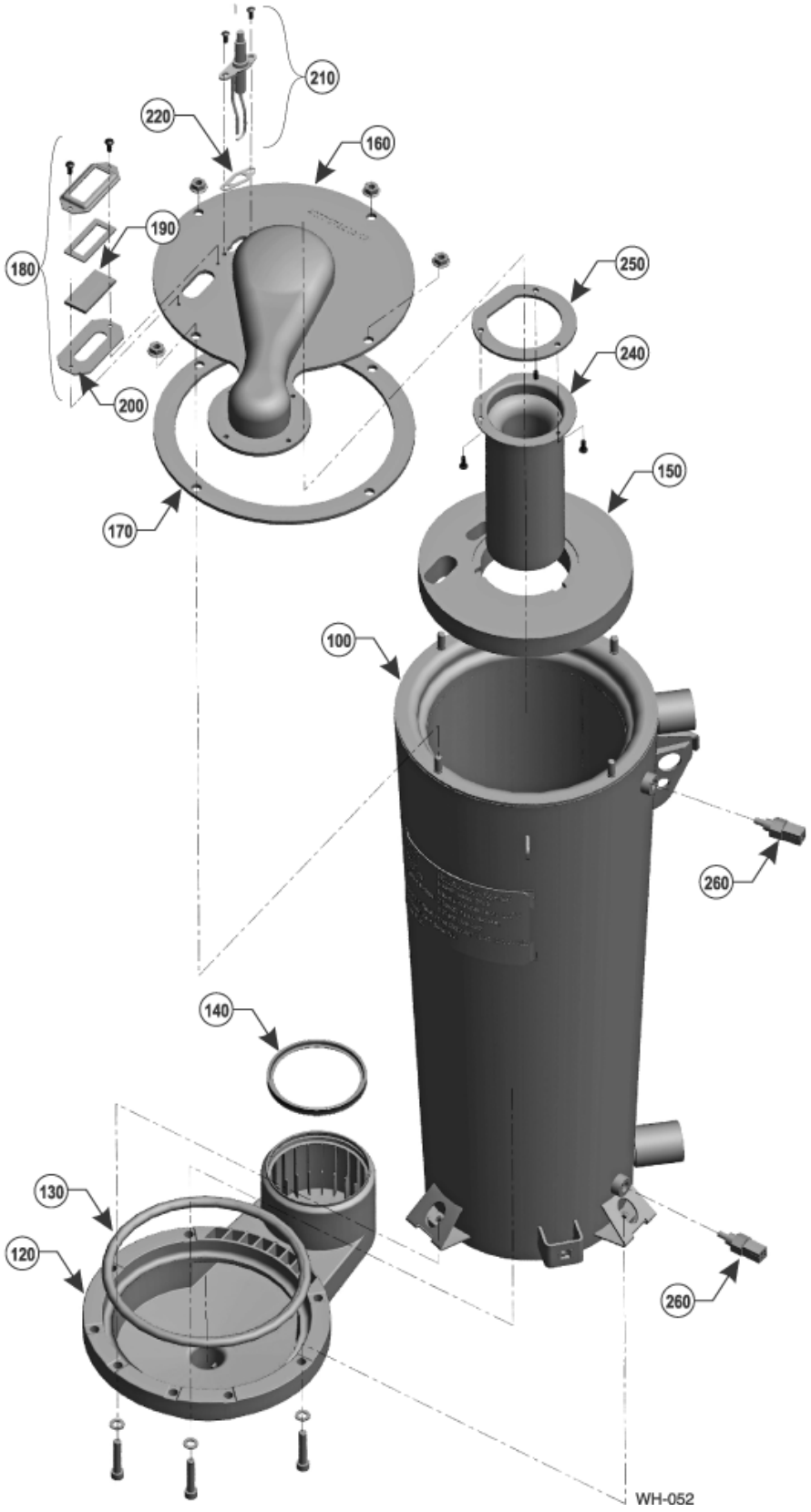
Replacement parts *(continued)*

Figure 126 Heat exchanger parts **WM97+70/110** (see Figure 127, page 123 for illustration)

Item	Name	Part Number
100	Heat exchanger	319-100-000
105	Heat exchanger with condensate dish, assembled (includes items 100, 120, 130 and 140)	383-700-175
110	Heat exchanger, condensate dish, cover plate, burner, igniter, sight glass, refractory, water sensors, gaskets, silicone, and hardware (includes items 120 through 240)	383-700-101
120	Condensate dish, gaskets, and hardware	383-700-102
130	Gasket to seal heat exchanger to condensate dish	383-700-103
140	Gasket to seal condensate dish to internal flue pipe	383-700-104
150	Refractory insulation & silicone sealant	383-700-105
160	Heat exchanger cover plate, refractory, silicone, and gaskets	383-700-108
170	Cover plate gasket (exchanger to gasket)	383-700-109
180	Sight glass kit (bracket, glass, gaskets, and hardware) (includes items 190 and 200)	383-700-185
190	Sight glass	591-419-202
200	Sight glass gaskets, upper and lower	383-700-112
210	Igniter kit (igniter, gasket and screws)	383-700-113
220	Igniter to cover plate gasket	590-300-034
240	Burner, gasket, and hardware (includes item 250)	383-700-106
250	Burner gasket	383-700-107
260	Heat exchanger water temperature sensor (one sensor for either boiler inlet or outlet water temperature)	511-724-296

Replacement parts *(continued)*

Figure 127 WM97+70/110 heat exchanger assembly (see Figure 126, page 122 for part numbers)



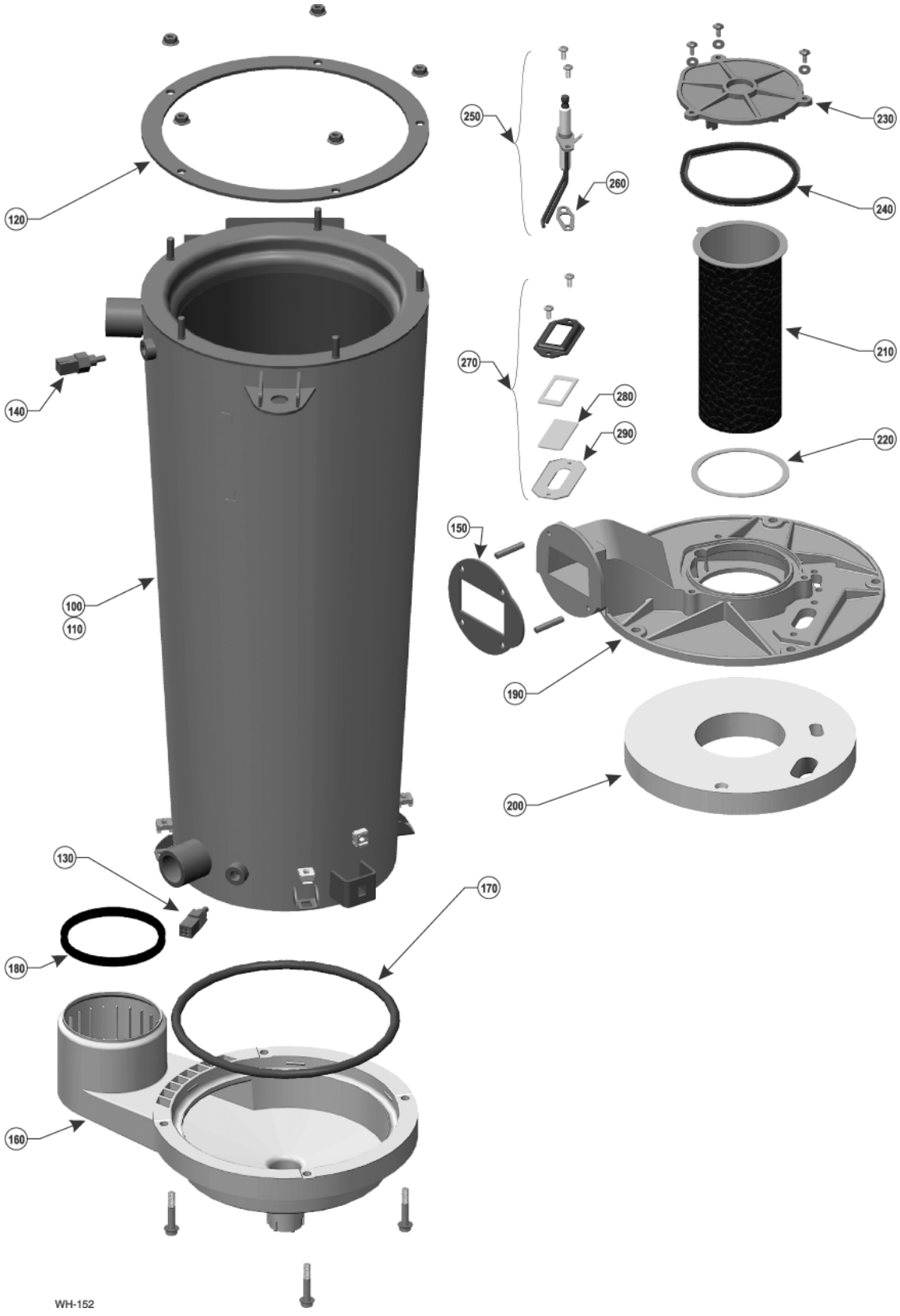
Replacement parts *(continued)*

Figure 128 Heat exchanger parts **WM97+155** (see Figure 129, page 125 for illustration)

Item	Name	Part Number
100	Heat exchanger	383-700-197
105	Heat exchanger with condensate dish, assembled (includes items 100, 160, 170 and 180)	383-700-198
110	Heat exchanger, condensate dish, cover plate, burner, igniter, sight glass, refractory, water sensors, gaskets, silicone, and hardware (includes items 120,)	383-700-180
120	Cover plate/heat exchanger gasket	590-318-054
130	Boiler inlet temperature sensor	511-724-296
140	Boiler outlet temperature sensor (same as item 130)	
150	Blower gasket	590-318-006
160	Condensate dish and hardware	383-700-181
170	Gasket to seal heat exchanger to condensate dish	590-300-039
180	Gasket to seal condensate dish to internal flue pipe	383-700-104
190	Heat exchanger cover plate, refractory and gaskets (includes items 200, 230, 260, 290 and 300)	383-700-184
200	Refractory insulation & silicone sealant	383-700-182
210	Burner, gasket, and hardware (includes item 220)	383-700-183
220	Burner gasket	590-318-055
230	Burner access cover, gasket and hardware (includes item 240)	383-700-202
240	Burner access cover gasket	590-318-053
250	Igniter kit (igniter, gasket and screws) (includes item 260)	383-700-187
260	Igniter gasket	383-700-107
270	Sight glass kit (bracket, glass, gaskets, and hardware) (includes items 280 and 290)	383-700-185
280	Sight glass	591-419-202
290	Sight glass gaskets, upper and lower	383-700-112

Replacement parts *(continued)*

Figure 129 WM97+155 heat exchanger assembly (see Figure 128, page 124 for part numbers)



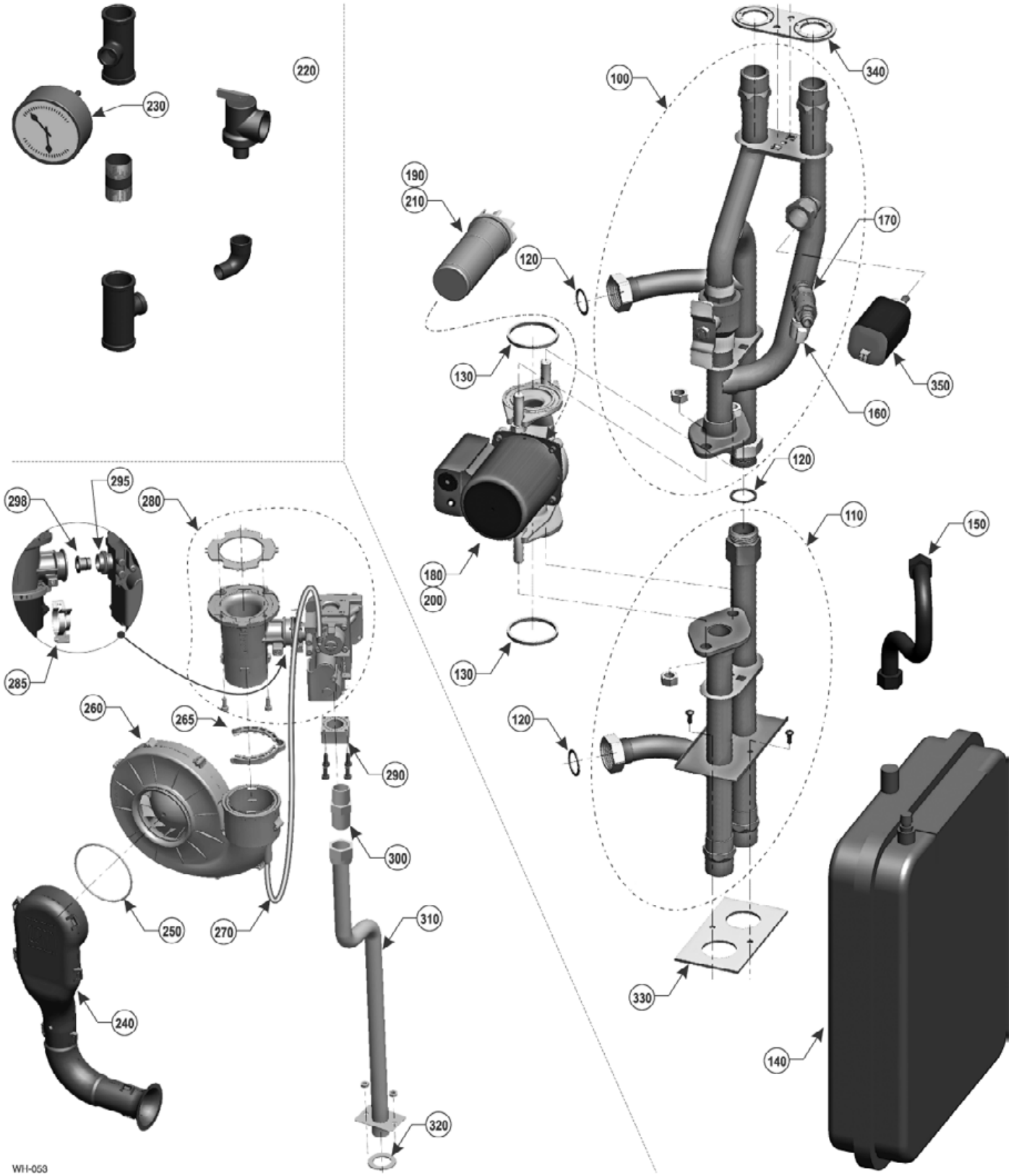
Replacement parts *(continued)*

Figure 130 Piping components for **WM97+70/110** (see Figure 131, page 127 for illustration)

Item	Name	Description / contents	Part Number	Model 70	Model 110
100	Upper water pipes	Upper pipe assembly and gaskets (1 pump, 2 water)	383-700-144	●	●
110	Lower water pipes	Lower pipe assembly and gaskets (1 pump, 2 water)	383-700-145	●	●
120	Water gaskets	Seal pipe to heat exchanger or upper pipe to lower pipe	590-300-036	●	●
130	Pump gasket	Gasket to seal pump flange to pipe flange	590-317-543	●	●
140	Expansion tank	12 Liter (3.2 gallons) expansion tank - pre-charged to 12 psi	383-700-148	●	●
150	Expansion tank line	Flared fitting stainless steel flex line	560-900-022	●	●
160	Expansion tank shutoff valve	Female NPT to flare manual ball valve	511-246-399	●	●
170	Expansion tank adapter	Female NPT to male flare	562-302-577	●	●
180	WM97+70 boiler circulator	Taco 007 & gaskets	383-700-152	●	
190	WM97+70 boiler circulator cartridge	Replacement cartridge for wet-rotor 007 circulator	511-405-142	●	
200	WM97+110 boiler circulator	Taco 0015 & gaskets	383-700-153		●
210	WM97+110 boiler circulator cartridge	Replacement cartridge for wet-rotor 0015 circulator	511-405-143		●
220	Relief valve	30 PSIG relief valve — shipped loose for field installation	383-500-095	●	●
230	Pressure & temperature gauge	Shipped loose for field installation	380-000-000	●	●
240	Air inlet silencer	Silencer	383-700-155	●	●
250	Silencer o-ring	O-ring	590-318-049	●	●
260	Blower	Blower & clip	383-700-157	●	●
265	Blower retainer clip	Clip	562-650-115	●	●
270	Reference tube	Tube to connect blower to gas valve	590-300-001	●	●
280	Valve/venturi assembly	Gas valve, venturi (027), gasket, o-ring, clip, and screws	383-700-159	●	
		Gas valve, venturi (040), gasket, o-ring, clip, and screws	383-700-160		●
285	Gas valve retainer clip	Clip	562-650-116	●	●
290	Gas valve adapter block	Threaded block, o-ring, and screws	563-910-031	●	●
295	Gas valve outlet o-ring	O-ring	590-318-045	●	●
298	Propane orifice — boilers converted to propane ONLY — available only with propane conversion kit — see Figure 122, page 118 for information		—	—	—
300	Gas flex line adapter	NPT to flare adapter	562-302-576	●	●
310	Gas flex line	Gas line, seal, and hardware	383-700-163	●	●
320	Gas flex line gasket	Gasket gas flex line to cabinet	590-300-027	●	●
330	Gasket - lower pipe	Gasket - lower pipe to cabinet	590-300-037	●	●
340	Gasket - upper pipe	Gasket - upper pipe to cabinet	590-318-050	●	●
350	Low water cutoff	Low water cutoff	571-100-006	●	●

Replacement parts *(continued)*

Figure 131 Piping components for **WM97+70/110** (see Figure 130, page 126 for part numbers)



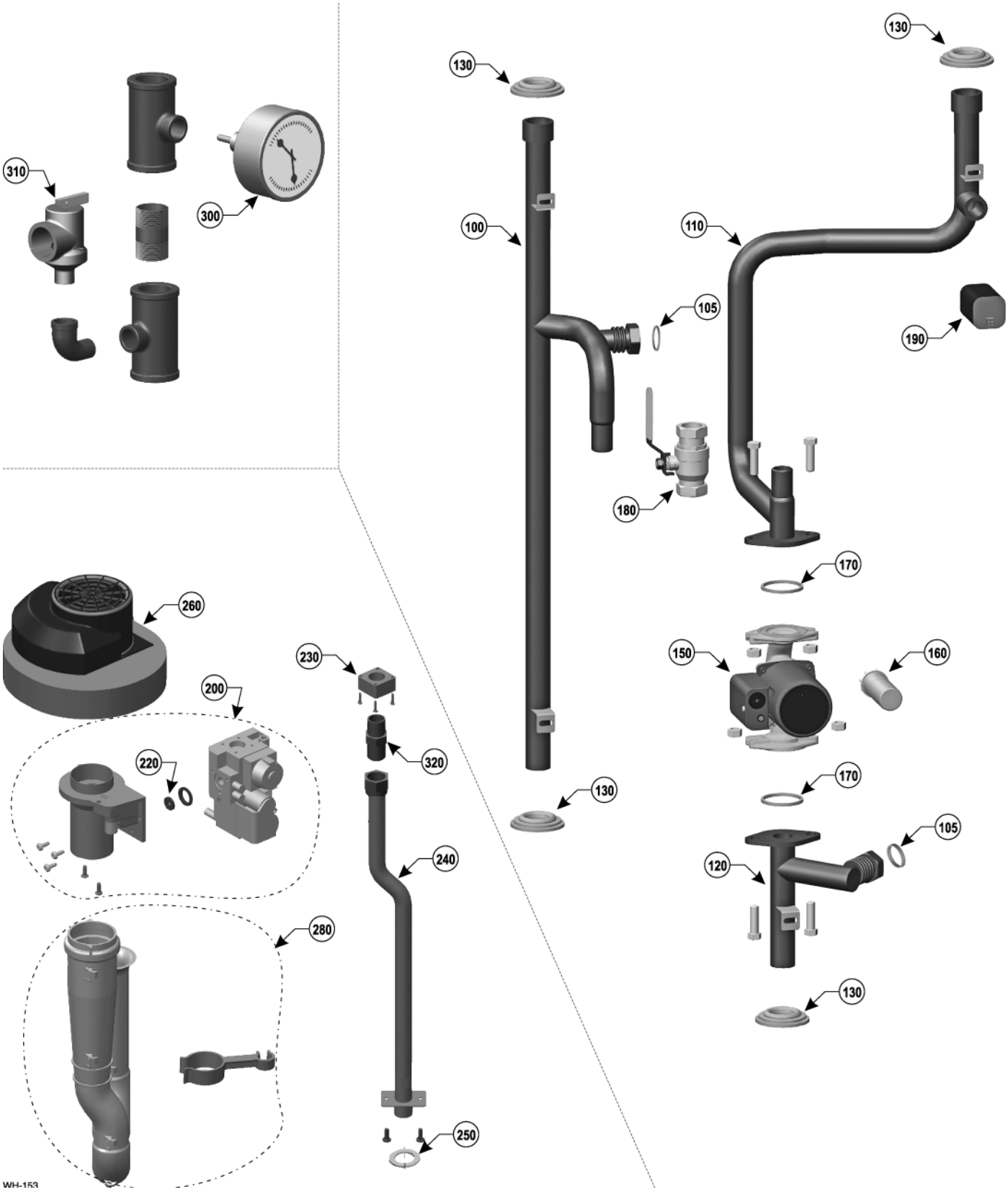
Replacement parts *(continued)*

Figure 132 Piping components for **WM97+155** (see Figure 133, page 129 for illustration)

Item	Name	Description / contents	Part Number
100	Supply manifold	Boiler supply pipe and hardware	383-700-193
105	Supply and return gaskets	Boiler supply and return connection seals	590-300-036
110	Upper return manifold	Boiler return pipe and hardware	383-700-192
120	Lower return manifold	Lower return manifold and hardware	383-700-191
130	Water line sealing grommets	Grommet	562-248-740
150	Boiler circulator	Taco 0015 (with rotated flange)	383-700-194
160	Circulator cartridge	Taco replacement cartridge for Model 0015 wet rotor circulator	511-405-143
170	Circulator gasket	Taco flange gasket	590-317-543
180	Internal primary/secondar by-pass valve	Ball valve, compression fitting connection	511-246-400
190	Low water cut-off	Low water cut-off	571-100-006
200	Gas valve	Gas valve, venturi, gasket and hardware	383-700-196
220	Propane orifice, if used	In propane conversion kit (see Figure 122, page 118 for number)	—
230	Gas valve adapter block	Threaded block, o-ring and screws	563-910-031
240	Gas flex line	Gas pipe and hardware	383-700-163
250	Gas pipe flange gasket	Gasket, gas flex line to cabinet	590-300-027
260	Blower	Blower	383-700-195
280	Inlet air silencer	Silencer with gasket and clip	383-700-203
300	Pressure & temperature gauge	Shipped loose for field installation	383-000-000
310	Relief valve	30 PSIG relief valve — shipped loose for field installation	383-500-095
320	Gas flex line adapter	NPT to flare adapter	562-302-571

Replacement parts *(continued)*

Figure 133 Piping components for **WM97+155** (see Figure 132, page 128 for part numbers)



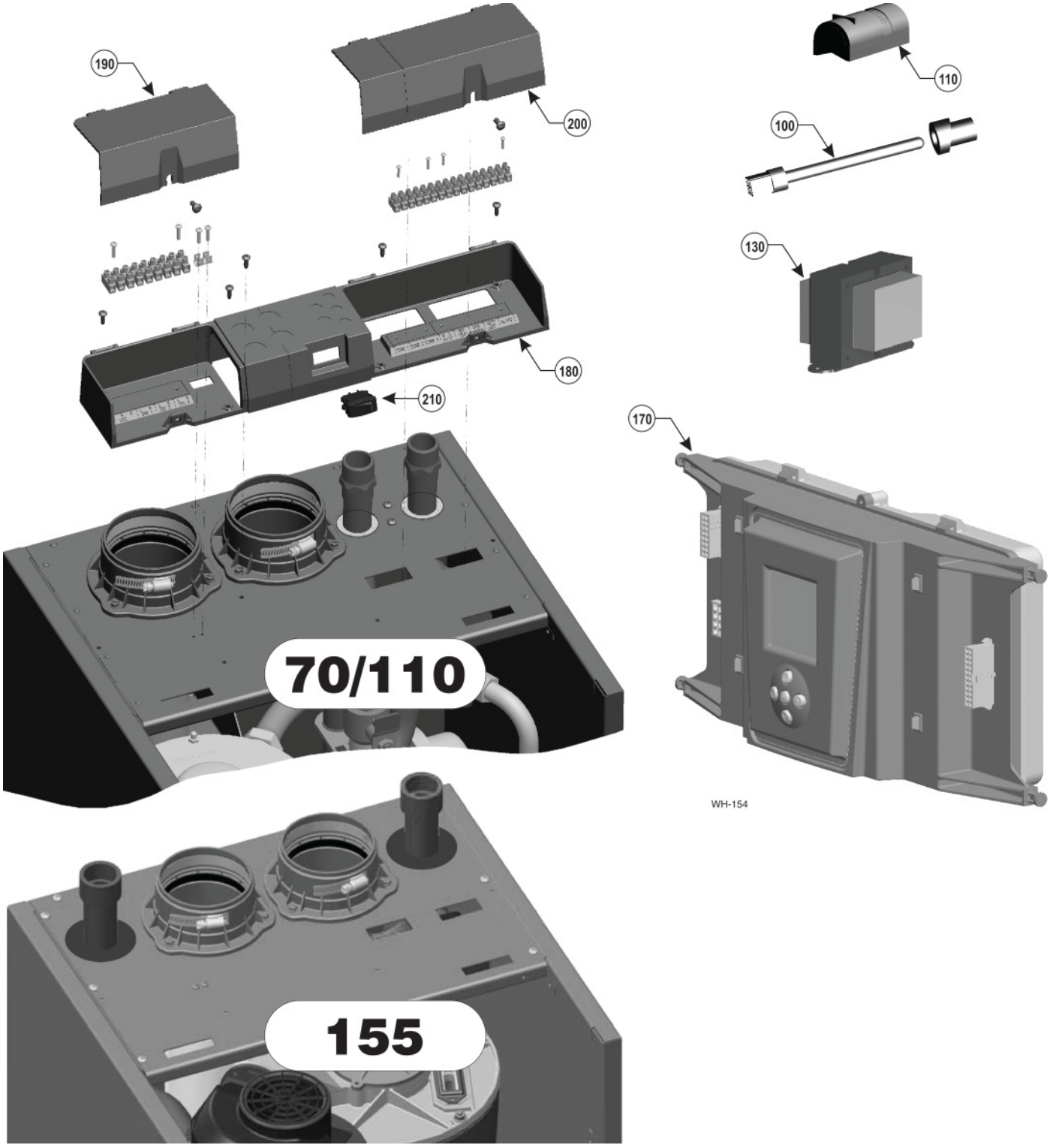
Replacement parts *(continued)*

Figure 134 Controls and electrical components — **WM97+70/110/155** (see Figure 135, page 131 for illustration)

Item	Name	Description / contents	Part Number
100	Flue temperature sensor	One sensor	511-724-292
110	Outdoor temperature sensor	One sensor	510-312-218
120	Low water cutoff (not shown here — see Figure 130, page 126)	Low water cutoff	571-100-006
130	Transformer 120v/24v	50 Va transformer	511-802-015
140	Wire harness — line voltage, 12-pin connector (not shown)	Wire harness with terminal strips (WM97+70 or 110)	591-391-969
		Wire harness with terminal strips (WM97+155)	591-391-993
150	Wire harness — low voltage, 16-pin connector (not shown)	Wire harness (WM97+70 or 110)	591-391-968
		Wire harness (WM97+155)	591-391-992
160	Wire harness — low voltage, 22-pin connnector (not shown)	Wire harness with terminal strips	591-391-967
165	Ignition cable (not shown)	Ignition cable (WM97+70 or 110)	383-500-619
		Ignition cable (WM97+155)	591-391-997
170	Control assembly	Ignition control, user display, pump control, wire harnesses, plastic, gasket, label	383-700-189
180	Electrical enclosure	Plastic electrical enclosure	595-000-033
190	Line voltage lid (left side)	Lid & label	383-700-173
200	Low voltage lid (right side)	Lid & label	383-700-174
210	On/off power switch		511-624-646
220	F1 - 3 amp, fast blow ato (5 fuses) (not shown here — see Figure 111, page 103)	5 Fuses	383-500-603
230	F2 - 12 amp, slow-blow ag (5 fuses) (not shown here — see Figure 111, page 103)	5 Fuses	383-500-604
240	Ground wire (not shown)	Wire harness ground, igniter to jacket	591-391-991

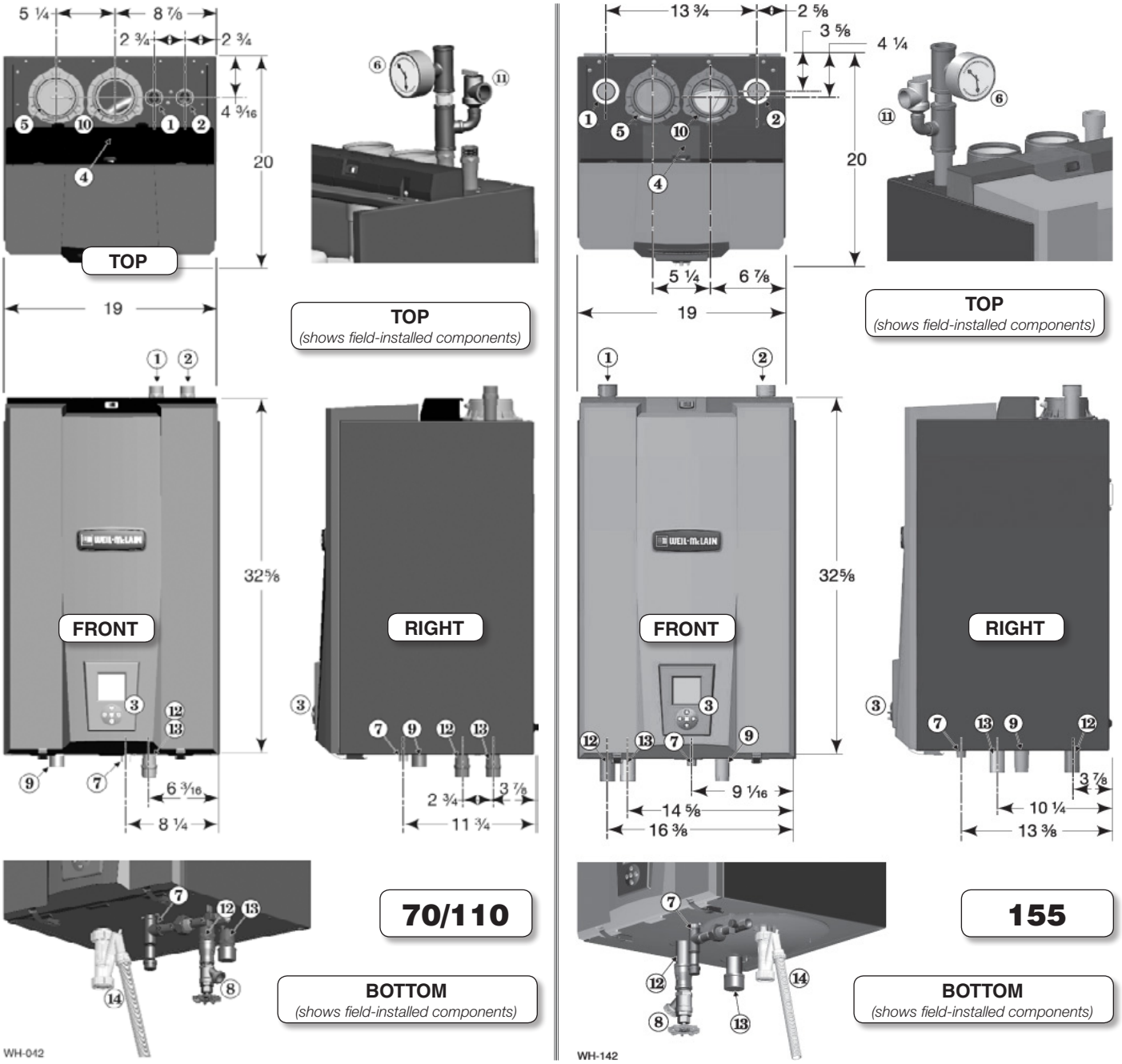
Replacement parts *(continued)*

Figure 135 Controls and electrical assemblies — **WM97+70/110/155** (see Figure 134, page 130 for part numbers)



Dimensions

Figure 136 Dimensional data — **WM97+70/110/155** (all dimensions in inches)



1 Boiler supply tapping —
1" NPT (70/110) / 1¼" NPT (155)

2 Boiler return tapping —
1" NPT (70/110) / 1¼" NPT (155)

3 Control panel, with display and navigation buttons

4 Electrical entrance openings

5 Vent connection: 3" PVC

6 Pressure/temperature gauge (shipped loosed)
See Figure 6, page 12 for mounting details and instructions.

7 Gas connection (note 1) (manual gas valve shipped loose for field installation)
See page 61 for details and instructions.

8 Drain valve (shipped loose)
See Figure 6, page 12 for mounting details and instructions.

9 Condensate drain connection (also see item 14, below)

10 Air connection: 3" PVC

11 Relief valve (shipped loose)
See page 37 for mounting details. Relief valve mounts on supply pipe off of supply tee and ¾" street elbow as shown.

12 Boiler drain line / DHW boiler water return line (if DHW tank is connected directly to the boiler)
See Figure 8, page 13 for details and instructions for usage.

13 DHW boiler water supply line (if DHW tank is connected directly to the boiler)
See Figure 8, page 13 for details and instructions for usage.

14 Condensate trap and flexible drain line (shipped loose)
See page 60 for details and instructions. The condensate drain hose or pipe must connect to the flexible line supplied with the boiler to ensure the trap assembly can be removed easily.

Ratings — WM97+ boilers

Figure 137 Ratings and engineering data — **WM97+70/110/155**

Boiler Model WM97+	CSA Output / DOE Heating capacity	CSA Input	Net I=B=R water rating	DOE Seasonal Efficiency	Boiler Water Content	Vent/ Comb. Air Connection Diameter	% Input derate vs vent length *(Values shown are at **MAX** vent/air pipe length — See Note 6)* **Direct Vent Venting ONLY**				Shipping Weight	Operating Weight
							Natural gas		Propane			
	Btuh *(Note 2)*	Btuh *(Note 5)*	Btuh *(Note 3)*	AFUE, % *(Note 1)*	Gallons	Inches *(Note 4)*	2" Vent/air piping	3" Vent/air piping	2" Vent/air piping	3" Vent/air piping	Pounds	Pounds
70-CT	65,000	70,000	57	95.2	2.8	3" PVC	12 %	5 %	12 %	5 %	162	140
110-CT	101,000	110,000	88	95.0	2.8	3" PVC	15 %	5 %	15 %	5 %	162	140
155-CT	143,000	155,000	124	95.1	3.4	3" PVC	N/A	5 %	N/A	5 %	162	150

Notes

1. As an Energy Star Partner, Weil-McLain has determined that WM97+ boilers meet the Energy Star guidelines for energy efficiency.
   NOTE: Adjusting boiler firing rate will affect AFUE rating.
2. Based on standard test procedures prescribed by the United States Department of Energy. Ratings also referred to as CSA Output.
   NOTE that only DOE Heating Capacity and AFUE are certified by AHRI. AFUE is also know as Annual Fuel Utilization Efficiency or Seasonal Efficiency.
3. Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.
4. WM97+ boilers must be direct-vented. WM97+ boilers require special venting, consistent with Category IV boiler. Use only the vent materials and methods specified in this manual.
   WM97+70 or 110 vent/air pipes can be either 2" or 3"
   WM97+155 vent/air pipes must be 3"
   All vent and air pipe elbows must be sweep elbows, NOT short-radius elbows.
5. Ratings shown are for sea level applications only. For altitudes from sea level to 5,500 feet above sea level, the WM97+ boiler requires no modifications and automatically derates itself by approximately 4% per 1000 feet above sea level.
6. All of the boilers will automatically de-rate as vent/air pipe length increases, due to the pressure loss through the piping. For vent/air pipe lengths less than the maximum, the derate equals the value above times vent length ÷ 100.

THE OUTDOOR SENSOR SUPPLIED WITH THE BOILER MUST BE INSTALLED UNLESS EXEMPTED BELOW:

IMPORTANT

In accordance with **Section 303 of the 2007 Energy Act**, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is not used for any space heating.
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil (not applicable to WM97+).

Ratings — Multiple WM97+ boilers

Figure 138 Ratings and engineering data — multiple WM97+ boilers

Boilers in system Model WM97+			Total CSA input	CSA Output / DOE Heating capacity	Boiler H.P.	Net water ratings	Manifolded combustion air duct size
			Input, MBH	Output, MBH	-	MBH	Square inches
70	**110**	**155**	-	Note 1	-	Note 2	Figure 64, page 56
2			140	130	3.9	114	70
	2		220	202	6.0	176	110
		2	310	286	8.5	248	155
3			210	195	5.8	171	105
	3		330	303	9.1	264	165
		3	465	429	12.8	372	233
4			280	260	7.8	228	140
	4		440	404	12.1	352	220
		4	620	572	17.1	496	310
5			350	325	9.7	285	175
	5		550	505	15.1	440	275
		5	775	715	21.4	620	388
6			420	390	11.7	342	210
	6		660	606	18.1	528	330
		6	930	858	25.6	744	465
7			490	455	13.6	399	245
	7		770	707	21.1	616	385
		7	1085	1001	29.9	868	543
8			560	520	15.5	456	280
	8		880	808	24.1	704	440
		8	1240	1144	34.2	992	620

Boiler Model WM97+	Shipping weight	Operating weight	Water content	Water flow rate per boiler		Vent/air pipe size: (Provide a separate vent for each boiler)	Electrical service required
	Pounds per boiler	Pounds per boiler	Gallons per boiler	GPM @ 20°F rise	GPM @ 40°F rise		Amps per boiler
		Note 4				Note 5	Note 3
70	136	140	2.8	6.5	3.3	2” or 3”	15.0
110	136	140	2.8	10.0	5.0	2” or 3”	15.0
155	162	150	3.4	14.3	7.2	3”	15.0

Notes	
1	Based on standard test procedures outlined by DOE for individual boilers.
2	Net I=B=R ratings are based on piping and pickup allowance of 1.15. Consult Weil-McLain Technical Services for other allowances.
3	Total amp requirement includes up to three circulators, not exceeding 2.2 amps per circulator.
4	Operating weight is the total weight of the boiler, including water.
5	WM97+70 or 110 vent/air pipes can be either 2” or 3” pipe. WM97+155 vent/air pipes must be 3”. All of the boilers will automatically de-rate as vent/air pipe length increases, due to the pressure loss through the piping. See Figure 137, page 133 for details. All WM97+ installations require a separate vent pipe and termination for each boiler. **Vent piping cannot be manifolded**. Install and terminate vents as described in vent/air installation instructions in this manual. Combustion air piping can be individually piped or manifolded. See Figure 64, page 56, for manifolded air piping.

Installation and Service Certificate

Boiler Start-Up Data			
Boiler Model / Series WM97+ _____ / Series ____		Date installed _____	CO_2 @: High fire _____% Low fire _____%
CP Number _____	FUEL: Natural ____ LP ____	Btu Input _____	CO @: High fire ____ ppm Low fire ____ ppm
Flame signal on control display at high fire _____		Flame signal on control display at low fire _____	
Was orifice changed? _____	Was gas valve throttle adjusted? _____	Natural gas input rate measured HIGH_____ CFH / LOW_____ CFH	

WM97+ control SET-UP DATA						
BOILER Settings	**HEAT Settings**		**DHW Settings (if installed)**		**CWH Settings (if installed)**	
Boiler Model WM97+ _____	System Type		DHW	OFF ___ ON ___	DHW	OFF ___ ON ___
High Altitude Yes ____ NO ____	Boiler Circ Speed	HIGH __ MED __ LOW __OFF __	Boiler Circ Speed	HIGH __ MED __ LOW __OFF __	Boiler Circ Speed	HIGH __ MED __ LOW __OFF __
Manual Reset Temp °F	Max Supply	°F	Boiler Supply	°F	Boiler Supply	°F
WWSD Temp °F	Min Supply	°F				
Adjust Outdoor °F	Max Outdoor	°F				
Circulator Exercising	Min Outdoor	°F				
Circulator 1: On ___ Off ___	Modulate On Diff	°F	Modulate On Diff	°F	Modulate On Diff	°F
Circulator 2: On ___ Off ___	Modulate Off Diff	°F	Modulate Off Diff	°F	Modulate Off Diff	°F
Circulator 3: On ___ Off ___	Min On Time	minutes	Max On Time	minutes	Max On Time	minutes
Boiler circ: On ___ Off ___	Boost Interval	minutes				
Freeze Protection	Pre-pump Time:	seconds	Pre-pump Time:	seconds	Pre-pump Time:	seconds
Circulator 1: On ___ Off ___	Post-pump Time:	seconds	Post-pump Time:	seconds	Post-pump Time:	seconds
Circulator 2: On ___ Off ___	Maximum Rate	RPM	Maximum Rate	RPM	Maximum Rate	RPM
Circulator 3: On ___ Off ___	Minimum Rate	RPM	Minimum Rate	RPM	Minimum Rate	RPM
Boiler circ: On ___ Off ___						

CERTIFIED THAT:

- ❑ Installation instructions have been followed.
- ❑ Check-out sequence has been performed.
- ❑ Above information is certified to be correct.
- ❑ Information received and left with owner/maintenance person.

Installer _____ _____

_____ _____

(Company) (Address) (Phone) (Installer's Signature)

WM97+ Gas Boiler Data Collection Sheet

Customer Info:	
Contact:	
Contractor:	
Job name:	
City, state:	
Distributor:	

Maintenance Info:	
Name:	
Phone:	
Model:	
CP#:	
Installed:	

System Components:	
Near boiler pipe size:	Top: _____ Bottom (DHW): _____
Boiler circulator speed:	HEATING: HIGH __ LOW __ MED __OFF __
	DHW: HIGH __ LOW __ MED __OFF __
DHW tank (yes/no):	
DHW direct/system:	
DHW model:	
DHW pipe size:	
DHW circulator model:	
Is there air in system?:	
CWH installed (yes/no):	
Diagnostic Errors:	
Control fault:	
Ignition retries:	
Manal reset CNT:	
Auto reset CNT:	
Software Versions:	
Display:	
Main micro:	
Second micro:	

Boiler/System Piping Details (Please Sketch)

Lockout History #1	
HH:MM MM/DD/YY:	
Status:	
Manual reset:	
If yes-description:	
Auto reset:	
If yes-description:	
Temperatures:	
Status:	
Boiler out 1:	
Boiler out 2:	
Boiler in 1:	
Flue 1:	
Flue 2:	
Outdoor:	
CWH Tank TOP:	
CWH Tank BTM:	
Inputs:	
Status:	
Input 1:	
Input 2:	
Input 3:	
Manual limit:	
Auto limit:	
Low WTR Cutoff:	
Blower tach:	
Flame signal:	
Outputs:	
Status:	
Gas valve:	
Boiler circulator:	
Circulator 1:	
Circulator 2:	
Circulator 3:	
Blower signal:	
Alarm:	

Lockout History #2	
HH:MM MM/DD/YY:	
Status:	
Manual reset:	
If yes-description:	
Auto reset:	
If yes-description:	
Temperatures:	
Status:	
Boiler out 1:	
Boiler out 2:	
Boiler in 1:	
Flue 1:	
Flue 2:	
Outdoor:	
CWH Tank TOP:	
CWH Tank BTM:	
Inputs:	
Status:	
Input 1:	
Input 2:	
Input 3:	
Manual limit:	
Auto limit:	
Low WTR Cutoff:	
Blower tach:	
Flame signal:	
Outputs:	
Status:	
Gas valve:	
Boiler circulator:	
Circulator 1:	
Circulator 2:	
Circulator 3:	
Blower signal:	
Alarm:	

Lockout History #3	
HH:MM MM/DD/YY:	
Status:	
Manual reset:	
If yes-description:	
Auto reset:	
If yes-description:	
Temperatures:	
Status:	
Boiler out 1:	
Boiler out 2:	
Boiler in 1:	
Flue 1:	
Flue 2:	
Outdoor:	
CWH Tank TOP:	
CWH Tank BTM:	
Inputs:	
Status:	
Input 1:	
Input 2:	
Input 3:	
Manual limit:	
Auto limit:	
Low WTR Cutoff:	
Blower tach:	
Flame signal:	
Outputs:	
Status:	
Gas valve:	
Boiler circulator:	
Circulator 1:	
Circulator 2:	
Circulator 3:	
Blower signal:	
Alarm:	

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